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ggtgatacttctacaatcagaagtcaaggccaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggctatttctgtgcaagagtggtgtactatagtaactcttactgggtactcagatgtctggggcac
agggaccacggtcaccgtctcttctgatcaatccaactctgaagaagcaagaagaggaggccaaaaaggaggaagccaaga
aatctaacagcgtcgacattgttctgactcagctccagccaccctgtctgtgactccaggagatagagtctcttctcctgcagggcc
5 agccagagtattagcgactacttacactgggtatcaacaaaaatcacatgagcttccaaggcttctcatcaaatatgcttccattccatc
tctgggatccctccagggtcagtgaggcagtgaggatcagggtcagatttactctcagtatcaacagtgtggaacctgaagatgttgaa
tttattactgtcaacatggtcacagcttccgtggacgttcgggtggaggcaccaagctggaaatcaaacggggtggcgggtggctcg
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caggatctcctgcaaggcttctgggtatgccttcacaactactggaatgcagtggtgcaagagatgccaggaaagggttgagt
10 ggattggctggataaacaccccactctggagtgccaaaatagtgaagacttcaaggacggttgccttctcttggaaacctctgc
caacactgcatatttacagataagcaacctcaagatgaggacacggctacgtatttctgtgtgagatccgggaatgttaactatga
cctggcctactttgcttactggggccaaggacactggcactgtctctgatcaggagcccaaatctctgacaaaactcacacatcc
ccaccgtccccagcacctgaactcctggggggatcgtcttctcttcccccaaaacccaaggacacctcatgatctcccg
gacccctgaggtcacatgcgtgggtgggtgacgtgagccacgaagacctgaggtcaagttcaactgggtacgtggacggcgtgga
15 ggtgcataatgccaagacaaagccgcgggaggagcaglacacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcacca
ggactggctgaatggcaaggagtacaagtgaaggcttccaacaaagccctcccagccccatcgagaaaacaatctccaaagc
caaagggcagccccgagaaccacaggtgtacacctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacct
gcctgggtcaaaggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacg
cctcccgtgctggactccgacggctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcagggggaacgtct
20 tctcatgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatclaga

2H7-antiCD40 scFv MTH (SSS) MTCH2WICH3 (2H7-40.2.220Ig) (amino acid sequence) (SEQ ID NO: __)

MDFQVQIFSFLLISASVIIARGQIVLSQSPAILSPGGEKVTMTCRASSSVSYMHWY
25 QQKPGSSPKPWYIAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKGGGGSGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYSNSYWFYFDVWGTGTTVTVSSDQSNSEAK
KEEAKKEEAKSNSVDIVLTQSPATLSVTPGDRVSLSCRASQSISDYLHWYQQKSH
30 ESPRLLIKYASHSISGIPSRFSGSGSGSDFTLINSVEPEDVGIYYCQHHGHSFPWTFGG
GTKLEIKRGGGGSGGGSGGGGSIQLVQSGPELKKPGETVRISCKASGYAFTTTG
MQWVQEMPGLKWKWINTPLWSAKICRRLQGRFAFSLETSANTAYLQISNLKD

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EDTATYFCVRSNGNYDLAYFAYWGQGLVTVSDQEPKSSDKTHTSPSPAPPELL
GGSSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTK
PREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPRE
PQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPVLDS
5 GSFFLYSKLTVDKSRWQQGNVFCFVMSHEALHNHYTQKSLSLSPGK

5B9 VH (includes the VH leader peptide) (nucleotide sequence) (SEQ ID NO: __)

atggctgtcttggggctgctcttgcctggtagacattccaagctgtgcctatcccaggtgcagctgaagcagtcaggacctggcc
tagtgacgtcctcacagagcctgtccatcacctgcacagtctctggtttcattactacattgctgtacactgggttcgccagtc
10 caggaaagggtctggagtggtggagtgatggagtggtggaatcacagactataatgcagctttcatatccagactgagcatc
accaaggacgattccaagagccaagtttctttaaataaacagctgcaacctaatgacacagccatttattactgtgccagaaatg
ggggtgataactacccttattactatgctatggactactgggggtcaaggaacctcagtcaccgtctcctca

5B9 VH (minus the leader) (nucleotide sequence) (SEQ ID NO: __)

cagggtgcagctgaagcagtcaggacctggcctagtgacgtcctcacagagcctgtccatcacctgcacagtctctggtttcatt
15 actacattgctgtacactgggttcgccagtcctcaggaaagggtctggagtggtgggtggagtgatggagtggtggaatcacaga
ctataatgcagctttcatatccagactgagcatcaccaaggacgattccaagagccaagtttctttaaataaacagctgcaacct
atgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatggactactggggicaaggaacctca
gtcaccgtctcctca

20

5B9 VH (includes leader peptide) (amino acid sequence) (SEQ ID NO: __)

MAVLGLLFCLVTFPSCVLSQVQLKQSGPGLVQSSQSLSTCTVSGFSLTTYAVHWV
RQSPGKGLEWLGVIWSSGITDYNAAFISRLSITKDDSKSQVFFKMNSLQPNDAIY
YCARNGGDNYPYYYAMDYWGQGSVTVSS

25

5B9 VH (no leader peptide) (amino acid sequence) (SEQ ID NO: __)

QVQLKQSGPGLVQSSQSLSTCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSSGI
TDYNAAFISRLSITKDDSKSQVFFKMNSLQPNDAIYYCARNGGDNYPYYYAMDY
WGQGSVTVSS

30

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5B9 VL (nucleotide sequence) (SEQ ID NO: __)

atgaggttctctgctcagcttctggggctgcttgtgctctggatccctggatccactgcagatattgtgatgacgaggctgcattctc
caatccagtcactcttgaacatcagcttccatctctgcaggtctagtaagagtctcctacatagtaatggcatcactatttgattgg
tatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaacctgcctcaggagtcccagacagggtcagtagca
5 gtgggtcaggaactgatttcacactgagaatcagcagagtggaggctgaggatgtgggtgtttattactgtgctcaaatctagaact
tccgctcacgttcggtgctgggaccaagctggagctgaaacgg

5B9 VL (amino acid sequence) (SEQ ID NO: __)

MRFSAQLLGLLVLPWPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHLSNGITY
10 LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKR

5B9 scFv (nucleotide sequence) (SEQ ID NO: __)

aagcttccgccatgaggttctctgctcagcttctggggctgcttgtgctctggatccctggatccactgcagatattgtgatgacgca
15 ggctgcattctccaatccagtcactcttgaacatcagcttccatctctgcaggtctagtaagagtcctacatagtaatggcatca
cttatttgattggtatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaacctgcctcaggagtcccagaca
gggtcagtagcagtggggtcaggaactgatttcacactgagaatcagcagagtggaggctgaggatgtgggtgtttattactgtgctc
aaaatctagaacttccgctcacgttcggtgctgggaccaagctggagctgaaacggggtggcgtggctcgggcgggtgggtgggt
cgggtggcggcgatcgtcacagggtcagctgaagcagtcaggacctggcctagtgcagtcctcacagacctgtccatcacct
20 gcacagtctctggtttctattaactacatgctgtacactgggttcgccagtctccaggaaagggtctggagtggctgggagtgat
atggagtgtggaatcacagactataatgcagctttcatatccagactgagcatcaccaaggacgattccaagaccaagttttctt
aaaatgaacagtctgcaacctaatgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
ctactggggtcaaggaacctcagtcaccgtctcctct

25 5B9 scFv (amino acid sequence) (SEQ ID NO: __)

MRFSAQLLGLLVLPWPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHLSNGITY
LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGSGGGSGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSGITDYNAAFISRLSITKDDSK
30 SQVFFKMNSLQPNDAIYYCARNGDNYPIYYAMDYWGQGTSVTVSS

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5B9 scFv-hmflgG1-hCD80 (nucleotide sequence) (SEQ ID NO: __)

aagcttcccgcacatgaggttctctgctcagcttctggggctgcttgtgctctggatccctggatccactgcagatattgtgatgacgca
ggctgcattctccaatccagtcactcttgaacatcagcttccatctcctgcaggctagtaagagtcctacatagtaaatggcatca
5 cttatttgatttggtatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaaccttgcctcaggagctccagaca
ggttcagtagcagtgggtcaggaaactgatttcacactgagaatcagcagagtgagggtgaggatgtgggtgtttattactgtgctc
aaaatctagaacttccgctcacgttcgggtgctgggaccaagctggagctgaaacgggggtggcgggtggctcgggcgggtgggtgggt
cgggtggcggcgatgctcacagggtgcagctgaagcagtcaggacctggcctagtgcagtcctcacagagcctgtccatcacct
gcacagctctggtttctcattaactacatgctgtacactgggttcgccagcttccaggaaagggtctggagtggtgggagtgat
10 atggagtggtggaatcacagactataatgcagcttccatccagactgagcatcaccaaggacgattccaagagccaagtttcttt
aaaatgaacagctctgcaacctaatgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
ctactgggtgcaaggaacctcagtcaccgtctcctctgatctggagcccaaatctctgacaaaactcacacaagcccaccgagcc
cagcacctgaactcctggggggatgctcagctctcctcttcccccaaaacccaaggacacctcatgatctcccgaccctgag
gtcacatgcgtggtggtggacgtgagccacgaagacctgaggtcaagtccaactggtacgtggacggcgtggaggtgcataat
15 gccaaagacaaagccgcgggaggagcagtlacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggct
gaatggcaaggagtlacaagtgaaggtctccaacaaagccctcccagcccccatcgagaaaaccatctccaaagccaaagggc
agccccgagaaccacaggtgtacacctgcccccalccgggatgagctgaccaagaaccaggtcagcctgacctgacctggtca
aaggcttctatccagcgacatcgccgtggagtgaggagcaatgggcagccgggagaacaactacaagaccacgcctcccggtg
ctggactccgacggctccttctcctctacagcaagctcaccgtggacaagagcaggtggcagcagggaacgtcttctcatgctc
20 cgtgatgcatgaggctctgcacaaccactacagcagaagagcctctccctgtctccgggtaaagcggatccttgaacctgctcc
catcctgggccattaccttaatctcagtaaatggaatttttgatgatgctgcctgacctactgctttgccccaaagatgcagagagaga
aggagggaatgagagattgagaagggaagtgtacgcctgtataaatcgatactcgag

5B9 scFv-hmflgG1-hCD80 (amino acid sequence) (SEQ ID NO: __)

MRFSAQLLGLLVLWIPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHLSNGITY
LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGSGGGSGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVWSSGGITDYNAAFISRLSITKDDSK
SQVFFKMNSLQPNDAIYYCARNGGDNYPPYYAMDYWGQTSVTVSSDLEPKSS
30 DKTHTSPPSPAPPELLGGSSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFNW
YVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPA
PIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQP

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ENNYKTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSVMSHEALHNHYTQKSLS
LSPGKADPSNLLPSWAITLISVNGIFVICCLTYCFAPRCRERRRNERLRRESVRPV

2e12 scFv WTH CH2 CH3 (2e12 scFv-WthIgG-CD80) (nucleotide sequence) (SEQ

5 ID NO: __)

aagcttatggattttcaagtcagattttcagcttctgctaatacagtcgttcagtcataatgtccagaggagtcgacattgtgtcacc
aatctccagcttcttggctgtgtctctaggtcagagagccaccatctctgcagagccagtgaaggtgtgaatattatgcacaagtt
taatgcagtggtaccaacagaaaccaggacagccacccaaactcctcatctctgctgcaccaacgtagaatctggggtccctgcc
aggtttagtggtcagtggtgtggacagacttcagcctcaacatccatcctgtggaggaggatgataatgcaatgtatttctgtcagc
10 aaagtaggaaggttcttggacgttcggtggagggaccaagctggaaatcaaacggggtggcgggtggtcggcgagggtggg
tcgggtggcggcgatctcaggtgcagctgaaggagtcaggacctggcctggtggcgccctcacagagcctgtccatcacatgc
accgtctcaggggttcalttaaccggctatggtgtaaacgtgggtgccagcctccaggaaagggtctggagtggctgggaatgat
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aaaaatgaacagctctgcaaactgatgacacagccagataclactgtgccagagatggttatagtaactttcattactatgttatggact
15 actggggtcaaggaaacctcagtcaccgtctcctcagatctggagcccaaatcttgcacaaaactcacacatgccaccgtgccca
gcacctgaactcctggggggaccgtcagcttctcttcccccaaaacccaaaggacacctcatgatctccggaccctgaggt
cacatgcgtggtggtggacgtgagccacgaagaccctgaggtcaagtcaactggtacgtggacggcgtggaggtgcataatgc
caagacaaagccggggaggagcagtaaacagcagctaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctga
atggcaaggagtacaagtcaaggctccaacaagccctccagcccccacgagaaaacctctccaaagccaaagggcag
20 ccccgagaaccacaggtgtacaccctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgctgtgcaaa
ggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaaactacaagaccacgcctccctgct
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gtgatgcatgaggtctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaacgggatcttgaacctgctccc
atcctgggccattacctaatactcagtaaatggaattttgtgatagctgcctgacctactgctttgccccaaagatgcagagagagaa
25 ggaggaatgagagattgagaagggaaggtgtacgcctgtataaatcgat

2e12 scFv WTH CH2 CH3 (2e12 scFv-WthIgG-CD80) (amino acid sequence) (SEQ
ID NO: __)

MDFQVQIFSFLLISASVIMSRGVDIVLTQSPASLAVSLGQRATISCRASESVEYYVTS
30 LMQWYQQKPGQPPKLLISAASNVESGVPARFSGSGSGTDFSLNIHPVEEDDIAMYF
CQQSRKVPWTFGGGTKEIKRGGGGSGGGSGGGGSQVQLKESGPGLVAPSQSLS
ITCTVSGFSLTGYGVNWVRQPPGKGLEWLGMIWGDGSTDYNSALKSRLSITKDNS

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KSQVFLKMNSLQTDDTARYYCARGYSNFHYVMDYWGQGTSTVTVSSDLEPKS
CDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFN
WYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALP
APIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQ
5 PENNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFSQVMHEALHNHYTQKSL
SLSPGKADPSNLLPSWATLISVNGIFVICCLTYCFAPRCRERRRRNERLRRESVRPV

2H7-human IgE Fc (CH2-CH3-CH4) (nucleotide sequence) (SEQ ID NO: __)

aagcttccgccatggatttcaagtcagatttcagcttctgctaatacagtcgttcagtcataattgccagaggacaaattgttctct
10 cccagctccagcaatcctgtctgcattccaggaggagaaggtcacatgactgcagggccagctcaagtgaattacatgcact
ggtagcagcagaagccaggatcctccccaaacctggatttatccccatccaacctggcttctggagtcctctgctcgttcagtg
gcagtggtgtctgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgagggtt
taaccacccacgttcggtgctgggaccaagctggagctgaaaggtggcggctggcggcgggtggatctggaggaggtg
ggagctctcaggcttatctacagcagctggggctgagctggtgaggcctggggcctcagtgagatgctctgcaaggcttctggc
15 tacacatttaccagttacaatatgcactgggttaaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
ggtgatacttctacaaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctattctgtgcaagagtggtgtactatagtaacttactggtagcttcgatgtctggggcac
agggaccacggtcaccgtctctgatcacgtctgctccagggaacttaccgccccaccgtgaagatcttacagtcgtctgcgacg
gcggcgggcaacttcccccgacctccagctcctgtgcctcgtctctgggtacacccagggaactatcaacatcacctggctgga
20 ggacgggcaggtcatggacgtggactgtccaccgcctctaccacgcagggaggtgagctggcctccacacaaagcgagctca
ccctcagccagaagcactggctgtcagaccgcactacactgccaggtcacctatcaaggtcacaccttggaggacagcaccac
gaagtgtcagattccaacccgagaggggtgagcgctacctaagccggccagcccgttcgacctgttcacccaagtgcgc
cacgatcacctgtctggtggtggacctggcaccagcaaggggaccgtgaacctgacctggctccgggaccagtggaagcctgt
gaaccactccaccagaaaggaggagaagcagcgcaatggcacgttaacctgcacgtccaccctgccggtgggcacccgagact
25 ggatcaggggggagacctaccagtgagggtgacccacccccacctgccaggggcctcatgggtccacgaccaagaccag
cgcccgctgctgctcccggaagtctatgcgtttgcgacgccggagtggccggggagccgggacaagcgacacctgcctgc
ctgatccagaactcatgcctgaggacatctcgttgagtgagtgacacagaggtgcagctcccgagccgggcacagcagc
acgcagccccgaagaccaagggtccgctcttctgcttcagccgcctggaggtgaccagggccgaatgggagcagaaaga
tgagttcatctgccgtgcagtcctatgaggcagcgagccctcacagaccgtccagcgagcggtgtctgtaaatcccggtaatgat
30 aatctaga

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2H7 scFv IgE (CH2-CH3-CH4) (amino acid sequence) (SEQ ID NO: __)

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 FNPPTFGAGTKLELKGGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
 5 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
 TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSDHVCSDRFTP
 PTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTASTTQE
 GELASTQSELTLSQKHWLSDRTYTCQVTYQGHTEFEDSTKKCADSNPRGVSAAYLSR
 PSPFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNGTLTV
 10 TSTLPVGTTRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATPEWP
 GSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKGSGFFVFSRLE
 VTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGK

2H7 scFv MH (SSS) MCH2WTCH3 (nucleotide sequence) (SEQ ID NO: __)

15 aagcttgcegccatggatttcaagtcagatttcagcttctgctaatacagtcgttcagtcataattgccagaggacaaattgttctct
 cccagctccagcaatcctgtctgcatctccaggggagaaggtaacaatgactgcagggccagctcaagtgttaattacatgcact
 ggtaccagcagaagccaggatcctccccaaccctggatttatgccccatccaacctggcttcggagtcctctgctcgttcagtg
 gcagtggtgtcgggacctcttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgaggatt
 taacccaccacgttcggtgctgggaccaagctggagctgaaagatggcgggtgctcggcggtggtggatctggaggaggtg
 20 ggagctctcaggcttatctacagcagctctggggctgagctggtgagcctggggcctcagtgaaatgctctgcaaggctctggc
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 cagcctgacatctgaagactctgcggtctatttctgtgcaagagtggtgtactatagtaactcttactggtacttcgatgtctggggcac
 agggaccacggtcaccgtctctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtccccagcacctgaac
 25 tcttgggggatcgtcagcttctcttcccccaaaaccaaggacacctcatgatctccggaccctgaggtcacatgcgtg
 gtggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgccaagacaaag
 ccgctggaggagcagtaaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaagga
 gtacaagtcaagggtccaacaaagccctccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaac
 cacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgtaaggcttctatcc
 30 cagcgacatcgccgtggagtgaggagcaatgggcagccggagaacaactacaagaccacgcctcccgctgctggactccgac
 ggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatga
 ggctctgcacaaccactacacgcagaagagcctctccctgtctccggtaaatgatctaga

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2H7 scFv MH (SSS) MCH2WTCH3 (amino acid sequence) (SEQ ID NO: __)

MDFQVQIFSFLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 5 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
 TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFVDVWGTGTTVTVSSDQEPKSSDK
 THTSPSPAPELLGGSSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
 DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
 10 KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
 NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
 PGK

5B9 scFv MTHWTCH2CH3 (nucleotide sequence) (SEQ ID NO: __)

15 aagcttgccgcatgaggttctctgctcagcttctggggctgcttgctcctggatccactgcagatattgtgacgca
 ggctgcatctccaatccagtcactcttgaacatcagcttccatctcctgcaggtctagtaagagctcctacatagtaatggcatca
 ctatttgtattggtatctgcagaagccaggcagctcctcagctcctgattatcagatgtccaacctgcctcaggagtcccagaca
 ggticagtagcagtggtcaggaactgattcacactgagaatcagcagagtgagggtgaggatgtgggtgttattactgtgtc
 aaaatctagaactccgctcacgttcggtgctgggaccaagctggagctgaacgggggtggcgggtggctcgggcgggtgggt
 20 cgggtggcggcgatcgtcacaggtgcagctgaagcagtcaggacctggcctagtgcagtcctcacagagcctgtccatcacct
 gcacagtctctggttctcattaactacatgctgtacactgggttcgacgtcctcaggaaagggtctggagtggctgggagtgt
 atggagtgggtgaatcacagactataatgcagcttccatccagactgagcatcaccaaggacgattccaagagccaagtcttctt
 aaaatgaacagtctgaacctaatgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
 ctactggggtaaggaacctcagtcaccgtctcctctgatcaggagcccaaatctctgacaaaactcacatccccaccgtcccc
 25 agcacctgaactcctgggggaccgtcagttctcttcccccaaaaccaaggacacctcatgatctccggacctgag
 gtcacatgcgtggtggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataat
 gccaaagacaagccggcgggaggagcagtaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggct
 gaatggcaaggagtacaagtgaaggtctccaacaaagccctcccagccccatcgagaaaacaatctcaaagccaaagggc
 agccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagctgacctgctgtgta
 30 aagcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaaacaactacaagaccacgcctccgtg
 ctggactccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctc
 cgtgatgcatgaggctctgcacaaccactacagcagaagagcctctcctgtctccgggtaaatgatctaga

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5B9 scFv MTHWTCH2CH3 (amino acid sequence) (SEQ ID NO: __)

MRFSAQLLGLLVLPWGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHLSNGITY
LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
5 AQNLELPLTFGAGTKLELKRGGGGSGGGGSGGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVVWSGGITDYNAAFISRLSITKDDSK
SQVFFKMNSLQPNDAIYYCARNGGDNYPIYYAMDYWGQGTSVTVSSDQEPKSS
DKTHTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFNW
YVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPA
10 PIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQP
ENNYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLS
LSPGK

Human IgG1 hinge mutations

2H7 scFv- MTH (CSS) WTCH2CH3 (nucleotide sequence) (SEQ ID NO: __)

15 aagcttgccgccatggatttcaagtcagatttccagcttcctgctaatactgcttcagtcataattgccagaggacaaattgtctct
cccagctccagcaatcctgtctgcattccaggggagaaggtcacatgactgcagggccagctcaagtgttaagttacatgcact
ggtagcagcagaagccaggatcctccccaaccctggattatgccccccaacctggcttctggagtcctgtcgttcagtg
gcagtggtgtgggaccttactctcacaatcagcagagtgagggtgaagatgctgccattactgccagcagtgagggtt
20 taaccacccacgttcggtgtgggaccaagctggagctgaagatggcgggtggctcgggcgggtggatctggaggaggtg
ggagctctcaggcttatctacagcagctcggggtgagctggtagggcctgggacctcagtgaaatgctcgaaggctctggc
tacacattaccagttacaalatgcactgggtaagcagacacctagacagggcctggaatggattggagctattatccaggaaat
ggtagacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcgggtctatttctgtgaagagtggtgactatagtaactcttactggtagctcgtctggggcac
25 agggaccacggtcaccgtctctctgatcaggagcccaaatctgtgacaaaactcacacatccccaccgtcccagcacctgaac
tctggggggaccgtcagcttctcttcccccaaaacccaaggacacctcatgatctccggacctgaggtcacatgcgtg
gtgtgggacgtgagccacgaagacctgaggtcaagttcaactggtagctggagcggcgtggaggtgcataatgccaagacaaag
ccgcgggaggagcagtacaacagcagctaccgtgtgtgtagcgtcctcaccgtcctgcaccaggactggctgaatggcaagga
gtacaagtgaaggtctccaacaagccctccagccccatcgagaaaacaatctcaaagccaaagggcacccccgagaac
30 cacaggtgtacacctgccccatcccggtgatgagctgaccaagaaccaggtcagcctgacctgctgtgcaaggcttctatcc
cagcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgcctcccggtgctggactccgac

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ggctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgttctcatgctccgtgatcatga
ggctctgcacaaccactacacgcagaagagcctctccctgtctccggtaaatgatctaga

2H7 scFv- MTH (CSS) WTCH2CH3 (amino acid sequence) (SEQ ID NO: __)

5 MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPTTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFVDVWGTGTTVTVSSDQEPKSCDK
10 THTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLS
PGK

15

2H7 scFv- MTH (SCS) WTCH2CH3 (nucleotide sequence) (SEQ ID NO: __)

aagcctgccgccatggatttcaagtcagatttcagcttctgctaatacagtgcttcagtcataatgccagaggacaaatgttctct
cccagctccagcaatcctgtctgcctccaggggagaaggtcacatgactgcagggccagctcaagtgttaagttacatgcact
ggtaccagcagaagccaggatcctccccaaacctggattatgccccatccaacctggcttctggagtcctgctcgcttcagtg
20 gcagtggtgtctgggacctcttactctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgaggttt
taaccacccacgctcggtgtctgggaccaagctggagctgaagatggcggtggctcggcggtggtggatctggaggaggtg
ggagctctcaggcttactacagcagctcggggtgagctggtgagcgctgggacctcagtgagatgctctgcaaggcttctggc
tacacattaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctattatccaggaaat
ggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
25 cagcctgacatctgaagactctgcggtctattctgtgcaagagtggtgtactatagtaactttactggtacttcgatgtctggggcac
agggaccacggtcaccgtctctctgatcaggagcccaaatctctgacaaaactcacacatgccaccgtcccagcacctgaac
tcttggggggaccgtcagcttctcttcccccaaaaccaaggacacctcatgatctccggaccctgaggtcacatgcgtg
gtggggagcgtgagccacgaagacctgaggtcaagtcaactggtacgtggacggcgtggaggtgcataatgccaagacaaag
ccgcgggaggagcagtacaacagcacgtaccgtgtggtcagcgtctcaccgtctgcaccaggactggctgaatggcaagga
30 gtacaagtgaaggctccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaac
cacaggtgtacacctgcccccattccgggagagctgaccaagaaccaggtcagcctgacctgcctggtaaggcttctatcc

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cagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgac
ggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatga
ggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

- 5 **2H7 scFv- MTH (SCS) WTCH2CH3 (amino acid sequence) (SEQ ID NO: __)**
MDFQVQIFSLLISASVIIARGQIVLSQSPAILSPGKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGSGGGSGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
10 TAYMQLSSLTSEDSAVYFCARVVYYNSYWFVDVWGTGTTVTVSSDQEPKSSDK
THTCPPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
NNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSL
15 SPGK

- 2H7 scFv- MTH (SSC) WTCH2CH3 (nucleotide sequence) (SEQ ID NO: __)**
aagcttgcgccatggatttcaagtcagatttgcagttcctgctaatactgcttcagtcataattgccagaggacaaattgttctct
cccagtcctcagcaatcctgtctgcactccaggggagaaggtcacaatgacttgcagggccagctcaagtgttaagttacatgcact
20 ggtaccagcagaagccaggatcctcccccaccctggatttatcccatcaacctggcttctggagtcctgtcgttcagtg
gcagtggtgtcggaccttactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggtt
taaccacccacgttcggtgtcggaccaagctggagctgaagatggcgggtggctcggcggtggtggatctggaggaggtg
ggagctcagggcttatctacagcagtcctgggctgagctggtgaggcctggggcctcagtgagatgtcctgcaaggcttctggc
tacacattaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
25 ggtgatacttctacaatcagaagttcaaggcaaggccacactgactgtagacaaatcctccagcagcctcatgcagctcag
cagcctgacatctgaagactctcgggtctatttctgtgaagagtggtgtactatagtaacttactgtgacttcatgtctggggcac
agggaccacggtcaccgtctcttctgatcaggagcccaatcttctgacaaaactcacacatccccaccgtgccagcactgaac
tcttggggggaccgtcagcttctcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtg
gtgtggacgtgagccacgaagacctgaggtcaagttcaactgtcagtggtggcgtggaggtgcataatgccaagacaaag
30 ccgcgggaggagcagtacaacagcagctaccgtgtgtgcagcgtcctcaccgtcctgcaccaggactggctgaatggcaagga
gtacaagtgcaaggtctccaacaagccctccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaac

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cacaggtgtacacctgccccatcccggtgatgagctgaccaagaaccaggtcagcctgacctgcctggtaaaggcttctatcc
cagcgacatcgccgtggagtgaggagagcaatgggcagccggagagaacaactacaagaccacgcctcccgctgctggactccgac
ggctccttctctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcata
ggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

5

2H7 scFv- MTH (SSC) WTCH2CH3 (amino acid sequence) (SEQ ID NO: __)

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
10 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
15 NNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSL
SPGK

HIgGMHcys1 (nucleotide sequence) (SEQ ID NO: __)

gtt gtt gat cag gag ccc aaa tct tct gac aaa act cac aca tg

20

HIgGMHcys2 (nucleotide sequence) (SEQ ID NO: __)

gtt gtt gat cag gag ccc aaa tct tgt gac aaa act cac aca tct cca ccg tgc

HIgGMHcys3 (nucleotide sequence) (SEQ ID NO: __)

25 gtt gtt gat cag gag ccc aaa tct tgt gac aaa act cac aca tgt cca ccg tcc cca gca cct

HuIgG1 MTCH3Y405 (nucleotide sequence) (SEQ ID NO: __)

gggcagccccgagaaccacaggtgtacacctgccccatcccgaggagatgaccaagaaccaggtcagcctgacctgcct
ggtaaaggcttctatcccgagacatcgccgtggagtgaggagagcaatgggcagccggagagaacaactacaagaccacgcctc

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ccgtgctggactccgacggctcctctacctctatagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctc
atgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

HuIgG1 MTCH3Y405 (amino acid sequence) (SEQ ID NO: __)

5 GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPP
VLDSGDSFYLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

HuIgG1 MTCH3A405 (nucleotide sequence) (SEQ ID NO: __)

gggcagccccgagaaccacaggtgtacacctgcccccatccgggaggagatgaccaagaaccaggtcagcctgacctgcct
10 ggtcaaaggcttctatcccagcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgcctc
ccgtgctggactccgacggctccttcgcccctctatagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctc
atgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

HuIgG1 MTCH3A405 (amino acid sequence) (SEQ ID NO: __)

15 GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPP
VLDSGDSFALYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

HuIgG1 MTCH3A407 (nucleotide sequence) (SEQ ID NO: __)

Gggcagccccgagaaccacaggtgtacacctgcccccatccgggaggagatgaccaagaaccaggtcagcctgacctgcc
20 tggtaaaggcttctatcccagcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgcct
cccgtgctggactccgacggctccttcttcctgccagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctc
catgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

HuIgG1 MTCH3A407 (amino acid sequence) (SEQ ID NO: __)

25 GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPP
VLDSGDSFFLASKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

HuIgG1 MTCH3Y405A407 (nucleotide sequence) (SEQ ID NO: __)

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gggcagccccgagaaccacaggtgtacacctgccccatccgggaggagatgaccaagaaccaggtcagcctgacctgcct
ggtcaaaggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctc
ccgtgctggactccgacggctccttctacctcgccagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctc
atgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

5

HuIgG1 MTCH3Y405A407 (amino acid sequence) (SEQ ID NO: __)

GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPP
VLDSGDSFYALASKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

10

HuIgG1 MTCH3A405A407 (nucleotide sequence) (SEQ ID NO: __)

gggcagccccgagaaccacaggtgtacacctgccccatccgggaggagatgaccaagaaccaggtcagcctgacctgcct
ggtcaaaggcttctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctc
ccgtgctggactccgacggctccttgcctcgccagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttct
catgctccgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtccccgggtaaatga

15

HuIgG1 MTCH3A405A407 (amino acid sequence) (SEQ ID NO: __)

GQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPP
VLDSGDSFALASKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

20

2H7 scFv MTH (SSS) WTCH2MTCH3Y405 (nucleotide sequence) (SEQ ID NO: __)

aagcttgcgccaatggattttcaagtcagattttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttgaggccagctcaagtgttaattacatgcact
ggtagcagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtgggtctgggaccttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtgaggatt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcgggagggtggatctggaggaggtg
ggagctctcaggcttatctacagcagcttggggctgagctggtgaggcctggggcctcagtgaagatgtcctgcaaggcttctggc
tacacattaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctatttatccaggaat
gggtatacttctacaatcagaagttcaaggccaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtactatagtaactcttactgggtactctgatgtctggggcac
agggaccacggtcaccgtctctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtccccagcacctgaac

30

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tcctgggggaccgtcagttctctctcccccaaaaccaaggacacctcatgatctccggaccttgaggtcacatgctg
gtgggtggacgtgagccacgaagacctgaggtcaagttcaactggtagcggcgtggaggtgcataatgccaagacaaag
ccgggggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaagga
gtacaagtgaaggtctccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaaggcagccccgagaac
5 cacaggtgtacacctgccccatccgggaggagatgaccaagaaccaggtcagcctgacctgctgtaaaggcttctatcc
cagcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgac
ggctccttctacctctatagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatga
ggctctgcacaaccactacacgcagaagagcctctcctgtccccgggtaaatgatctaga

10 **2H7 scFv MTH (SSS) WTCH2MTCH3Y405 (amino acid sequence) (SEQ ID NO: __)**
MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYIAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
15 TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSGDFYLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
20 PGK

2H7 scFv MTH (SSS) WTCH2MTCH3A405 (nucleotide sequence) (SEQ ID NO: __)
aagcttgccgccatggatttcaagtgcagattttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgaattacatgcact
25 ggtaccagcagaagccaggatcctccccaaacctggatttatccccatccaacctggcttctggagtccctgctcgttcagtg
gcagtggtgctgggaccttactcttcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtgaggtt
taaccacccacgttcggtgctgggaccaagctggagctgaagatggcgggtggctcgggcgggtggatctggaggaggtg
ggagctctcaggcttatctacagcagctcgggctgagctggtgaggcctgggcctcagtgaaatgctcctgcaaggcttctggc
tacacatttaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
30 ggtgatacttctacaatcagaagttcaagggcaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
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2H7 scFv MTH (SSS) WTCH2MTCH3A405 (nucleotide sequence) (SEQ ID NO: __)

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20 2H7 scFv MTH (SSS) WTCH2MTCH3A407 (nucleotide sequence) (SEQ ID NO: __)

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ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
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15 THTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
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2H7 scFv MTH (SSS) WTCH2MTCH3Y405A407 (nucleotide sequence) (SEQ ID NO: __)

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2H7 scFv MTH (SSS) WTCH2MTCH3Y405A407 (amino acid sequence) (SEQ ID NO: __)

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15 FNPPTFGAGTKLELKDGGGSGGGGSGGGSSQAYLQQSGAELVRPGASVKMSCK
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THTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
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20 KTISKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
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2H7 scFv MTH (SSS) WTCH2MTCH3A405A407 (nucleotide sequence) (SEQ ID NO: __)

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2H7 scFv MTH (SSS) WTCH2MTCH3A405A407 (amino acid sequence) (SEQ ID
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 20 TAYMQLSSLTSEDSAVYFCARVYYSNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
 THTSPSPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
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 KTISKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
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 25 PGK

2H7 scFv MTH (SCC) WTCH2CH3 (nucleotide sequence)
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2H7 scFv MTH (SCC) WTCH2CH3 (amino acid sequence)

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2H7 scFv MTH (CSC) WTCH2CH3 (nucleotide sequence)

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2H7 scFv MTH (CSC) WTCH2CH3 (amino acid sequence)

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20 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
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2H7 scFv MTH (CCS) WTCH2CH3 (nucleotide sequence)

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2H7 scFv MTH (CCS) WTCH2CH3 (amino acid sequence)

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SPGK

30 **HuIgAHIgA-T4-ORF (nucleotide sequence)**

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5 cgctaaccgccaccctctcaaaatccggaacacattccggcccgaggtccacctgctgccgccgctcgaggagctggccc
tgaacgagctgggtgacgtgacgtgcctggcacgtggcttcagccccaaggatgtgctggttcgctggctgcaggggtcacagg
agctgccccgcgagaagtacctgacttgggcatccggcaggagcccagccagggcaccaccaccttgcgtgtgaccagcata
ctgcgctggcagccgaggactggaagaagggggacaccttctctgcatggtggccacgaggccctgccgtggccttcac
acagaagaccatcgaccgcttggcgggtaaacccacccatgtcaatgtgtctgtgtcatggcggaggtggacgcggatccttga
10 ac

HuIgAHIgA-T4-ORF (amino acid sequence)

DQVPVSTPPTSPSTPPTSPSCCHPRLSLHRPALEDLLLGSEAILTCTLTGLRDASGV
TFTWTPSSGKSAVQGPDRDLGCGYSVSSVLPGCAEPWNHKGTFCTAAYPESKT
15 PLIATLSKSGNTFRPEVHLLPPPSEELALNELVTLTCLARGFSPKDVLRWLQGSQ
ELPREKYLTWASRQEPSQGTTFFAVTSILRVA AEDWKKGDTFSCMVGHEALPLAF
TQKTIDRLAGKPTHVNVSVVMAEVDADPSN

1D8-IgAH IgA-T4-CD80 (nucleotide sequence)

aagcttatggatttcaagtgcagatttcagcttctgctaatacgtgcttcagtcataatgtccagaggagtcgacattgtgctcactc
agtctccaacaacatagctgcatctccaggggagaaggtcaccatcacctgccgtgccagctccagtgaagtacatgtactggt
accagcagaagtcaggcgccctcccctaaactctggatttatgacacatccaagctggcttctggagtccaatcgcttcagtggca
gtgggtctgggacctctattctctcgaatcaacaccatggagactgaagatgctgccacttattactgtcagcagtgagtagtact
ccgctcacgttcgggtctgggaccaagctggagatcaaacgggggtggcgggtggctcgggcgggtgggtgggtggcggcg
25 gatctcaggtgcagctgaaggaggcaggacctggcctgggtgcaaccgacacagacctgtccctcacatgcactgtctctgggtt
ctcattaaccagcgtggtgtacactggattcgacagcctccaggaaagggtctggaatggatgggaataatatattatgatggagg
cacagattataattcgaattaaatccagactgagcatcagcaggacacctccaagagccaagtttttaaaaaataacagctctg
caaatgatgacacagccatgtattactgtgccagaatccactttgattactggggccaaggagtcattgtcacagtctcctctgac
agccagttccctcaactccacctaccccatctccctcaactccacctaccccatctccctcatgctgccacccccgactgtcactgca
30 ccgaccggccctcgaggacctgctcttaggttcagaagcgatcctcacgtgcacactgaccggcctgagagatgcctcaggtgtc
accttcacctggacgccctcaagtgggaagagcgctgttcaaggaccacctgacctgtgtggctgctacagcgtgtcca

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gtgtcctgccgggctgtgccgagccatggaacatgggaagaccttcactgcactgctgcctaccccagtgccaagaccccgt
aaccgccaccctctcaaatccggaaacacattccggcccagggtccacctgctgccgccccgctcggaggagctggccctgaa
cgagctgggtgacgctgacgtgcctggcacgtggcttcagcccaaggatgigtgtgtcgtgctgaggggtcacaggagct
gccccgcgagaagtacctgacttgggcatcccggcaggagcccagccaggggcaccaccaccttcgctgtgaccagcatactgc
5 gctgtggcagccgaggactggaagaagggggacaccttctcctgcatggtgggccacgaggccctgccgtggccttcacacag
aagaccatcgaccgcttggcgggtaaacccacccatgcaatgtgtctgtgtcatggcggagggtgacgcggatccttcgaacaa
cctgtcccatcctgggccattaccttaatctcagtaaatggaattttgtgatgtgctgcctgacctactgctttccccaagatgcag
agagagaaggaggaatgagagattgagaagggaagtgtacgccctgtataaatcgatac

AA

10 **1D8 scFv IgAH IgA-T4-CD80 (amino acid sequence)**

MDFQVQIFSFLISASVIMSRGVDIVLTQSPTTIAASPGEKVTTTCRASSSVSYMYWY
QQKSGASPKLWIYDTSKLGSGVGNRFSGSGSGTSYSLAINTMETEDAATYYCQQW
SSTPLTFSGTKLEIKRGGGSGGGGSGGGGSGVQLKEAGPGLVQPTQTLSTCTV
SGFSLTSDGVHWIRQPPGKGLEWMGIHYDGGTDYNSAIKSRLSISRDTSKSQVFLK
15 INSLQTTDDTAMYYCARIHFDYWGQGMVTVSSDQVPSTPPTPSPSTPPTPSPSCC
HPRLSLHRPALEDLLLGSEAILTCTLTGLRDASGVTFTWTPSSGKSAVQGPPDRDL
CGCYSVSSVLPGAEPWNHGKTFTCTAAYPESKTPLTATLSKSGNTRPEVHLLPP
PSEELALNELVTLTCLARGFSPKDVLRWLQGSQELPREKYLTWASRQEPSQGT
FAVTSILRVAEDWKKGDTFSCMVGHEALPLAFTQKTIDRLAGKPTHVNVSVVM
20 AEVDADPSNNLLPSWAITLISVNGIFVICCLTYCFAPRCRERRRNERLRRESVRPV

human IgE Fc (CH2-CH3-CH4) ORF (nucleotide sequence)

tgtacacgtctgtccagggacttcacccgccaccgtgaagatcttacagtcgtcctgcgacggcgggcacttcccccg
accatccagctcctgtgcctcgtctctgggtacacccagggactatcaacatcacctggctggaggacgggcagggtcatggacg
25 tggactgtccaccgctctaccacgcaggagggtgagctggcctccacaaaagcgagctcacctcagccagaagcactggc
tgtcagaccgcacctacacgtgccagggtcacctatcaaggtcacaccttgaggacagcaccagaaggtgtgcagattccaacc
gagaggggtgagcgctacctaagccggccagcccgttcgacctgttcacgcaagtcgccacgatcacctgtctggtggtg
gacctggcaccagcaaggggaccgtgaacctgacctgtgtccggggccagtggaagcctgtgaaccactccaccagaaagg
aggagaagcagcgcaatggcacgttaacctgcacgtccacctgccggtgggcacccgagactggatcaggggggagacct
30 ccagtgcagggtgaccacccccacctgccaggccctcatcggtccacgaccaagaccagcgcccgctgctgccccg
gaagtctatgcgttgcgacgccggagtgccggggagccgggacaagcgacccctgcctgctgatccagaactcatgct

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gaggacatctcggctgcagtggctgcacaacgaggtgcagctcccgagcccgccacagcacgacgcagccccgcaagacc
aagggctccggcttctcgtcttcagccgcctggaggtgaccagggccgaatgggagcagaaagatgagttcatctgccgtgcag
tccatgaggcagcgagccccctcacagaccgtccagcgagcgggtgtctgtaaatcccggtaaagcggatccttcgaa

AA

5 **human IgE Fc (CH2-CH3-CH4) ORF (amino acid sequence)**

DHVCSDFTPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDV
DLSTASTTQEGELASTQSELTLQKHWLSDRTYTCQVTYQGHTFEDSTKKCADSN
PRGVSAAYLSRSPFDLFIKRSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKE
EKQRNGTLTVTSTLPVGTRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPE
10 VYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTK
GSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGKADPS

1D8 scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (nucleotide sequence)

aagcttatggatttcaagtcagatlttcagcttctgtaatacagtgcttcagtcataatgtccagaggagtcgacatltgctcactc
15 agtctccaacaaccatagctgcatctccaggggagaagggtcaccatcacctgccgtgccagctccagtgtaagttacatgtactggt
accagcagaagtcaggcgcctccccctaaactctgatttatgacacatccaagctggcttctggagttccaaatcgcttcagtgga
gtgggtctgggacctcttattctctcgaatcaacacatggagactgaagatgctgccacttattactgacagcagtgaggtagtact
ccgctcacgttcgggtctgggaccaagctggagatcaaacggggtggcgggtggctcgggcgggtgggtgggtcgggtggcg
gatctcaggtgcagctgaaggaggcaggacctggcctggtgcaaccgacacagaccctgtccctcacatgcactgtctctgggtt
20 ctcaataaccagcgtggtgtactggttcgacagcctccaggaaagggtctggaatggatgggaataatattatgatggagg
cacagattataattcagcaattaaatccagactgagcatcagcaggacacctccaagagccaagtttcttaaaaatcaacagctg
caaactgatgacacagccatgtattactgtgccagaatccacttgattactggggccaaggagtcagtggtcacagtcctctgatc
acgtctgtccagggaattcaccccgccaccgtgaagatcttacagtcgtctcgcgacggcgggcgggcacttcccccgaccat
ccagctcctgtgcctcgtctctgggtacacccagggactatcaacatcacctggctggaggacgggcaggtcatggagctggac
25 ttgtccaccgcctctaccacgcaggagggtgagctggcctccacaaaagcagctcacctcagccagaagcactggctgtca
gaccgcacctacacctgccaggtcacctatcaaggtcacaccttgaggacagcaccaagaagtgagcagattccaacccgagag
gggtgagcgcctacctaagccggccagccggtcagctgttcatccgcaagtcgccacgatcacctgtctggtggtggacct
ggcaccagcaaggggaccgtgaacctgacctgggtccgggacagtggaagcctgtgaacctccaccagaaaggaggag
aagcagcgcaatggcacgttaaccgtcacgtccacctgccggtgggacccgagactggatcagggggagacctaccagt
30 cagggtgacccacccccacctgcccagggccctcatcggtccacagcaagaccagcgcccgctgctgccccggaagtct
atgcgttgcgacgccggagtggccggggagccgggacaagcgcaccctcgctgcctgatccagaactcatgcctgaggac

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atctcgggtgcagtggctgcacaacgaggtgcagctcccgacgcccggcacagcacgacgagccccgaagaccaagggct
ccggcttcttctgcttcagccgcctggaggtgaccagggccgaatgggagcagaaagatgagttcatctgccgtgcagtcctatga
ggcagcgagccccctcacagaccgtccagcgagcgggtgtctgtaaattcccgtaaagcggatccttcgaagctcccatcctgggc
cattaccttaatctcagtaaatggaattttgtgatatgctgcctgacctactgctttgcccccaagatgcagagagagaaggagggaatg
5 agagattgagaagggaaaagtgtacgccctgtataaatcgata

1D8-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (amino acid sequence)

MDFQVQIFSLLISASVIMSRGVDIVLTQSPTTIAASPGEKVTITCRASSSVSYMYWY
QQKSGASPKLWIYDTSKLGSGVPNRFSGSGSGTSYSLAINTMETEDAATYYCQQW
10 SSTPLTFGSGTKLEIKRGGGGSGGGGSGGGGSQVQLKEAGPGLVQPTQTLSLTCTV
SGFSLTSDGVHWIRQPPGKGLEWMGIYYDGGTDYNSAIKSRLSISRDTSKSQVFLK
INSLQTDDTAMYYCARIHFDYWGQGVMTVSSDHVCSRDFTPPTVKILQSSCDGG
GHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTASTTQEGELASTQSELTL
QKHWLSDRTYTCQVTYQGHTFEDSTKKCADSNPRGVSAYLSRPSPFDLFIRKSPTI
15 TCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNGTLTVTSTLPVGTRDWI
EGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATPEWPGSRDKRTLACLI
QNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKGSGFFVFSRLEVTRAWEQKDE
FICRAVHEAASPSQTVQRAVSVNPGKADPSKLPWAITLISVNGIFVICCLTYCFAP
RCRERRRNERLRRESVRPV

20

5B9-IgAH IgA-T4-CD80 (nucleotide sequence)

aagcttgccgccatgaggttctctgctcagcttctggggctgcttctgctctggatccctggatccactgcagataattgtgatgacgca
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cttatttgatttggtatctgcagaagccaggccagtcctcctcagctcctgatttatcagatgtccaacctgcctcaggagtcaggaca
25 ggttcagtagcagtggtcaggaactgattcacactgagaatcagcagagtgaggagtgaggatgtgggtgtttattactgtgctc
aaaactagaactccgctcacgttcggtgctgggaccaagctggagctgaaacgggggtggcgggtggctcgggcgggtgggtgggt
cgggtggcggcgggatgctcacaggtgcagctgaagcagtcaggacctggcctagtgcagtcctcacagagcctgtccatcacct
gcacagtctctggtttctattaactacatgctgtacactgggttcgccagctcctcaggaaagggtctggagtggctgggagtgat
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30 aaaatgaacagtctgcaacctaatgacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
ctactgggggtcaaggaacctcagtcaccgtctcctctgatcagccagttccctcaactccacctaccccatctccctcaactccacct

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accccatctccctcatgctgccacccccgactgtcaactgcaccgaccggccctcgaggacctgctcttaggttcagaagcgatcct
cacgtgcacactgaccggcctgagagatgcctcaggtgtcaccttcacctggacgccctcaagtgggaagagcgctgttcaagga
ccacctgaccgtgacctctgtggctgctacagcgtgtccagtgtcctgccgggctgtgccgagccatggaacctgggaagacctt
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5 cacctgctgccgccgccgtcgaggagctggccctgaacgagctggtgacgctgacgtgcctggcagctggcttcagcccca
ggatgtgctggttcgctggctgcaggggtcacaggagctgccccgcgagaagtacctgacttgggcatcccggcaggagccca
gccagggcaccaccaccttcgctgtgaccagcactgcgcgtggcagccgaggactggaagaagggggacaccttctcctgc
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ctgtgtcatggcggaggtggacgcggatccttcgaacaacctgctcccatcctggccattaccttaatctcagtaaatggaatttt
10 gtgatatgctgcctgacctactgctttgccccaaagtgcagagagagaaggaggaatgagagattgagaagggaagtgtacgcc
ctgtataaatcgatac

5B9-IgAH IgA-T4-CD80 (amino acid sequence)

MRFSAQLLGLLVLPWPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHLSNGITY
15 LYWYLQKPGQSPQLLIYQMSNLASGVPDFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLIFGAGTKLELKRGGGSGGGSGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVWSSGITDYNAAFISRLSITKDDSK
SQVFFKMNSLQPNDAIYYCARNGGDNYPIYYAMDYWGQGTSTVTVSSDQVPVST
PPTPSPSTPPTPSPSCCHPRLSLHRPALEDLLLSEAILTCTLTGLRDASGVTFWTTPS
20 SGKSAVQGPPDRDLGCGYSVSSVLPGCAEPWNHGKTFCTAAYPESKTPLTATLS
KSGNTFRPEVHLLPPPSEELALNELVTLTCLARGFSPKDLVRWLQGSQELPREKY
LTWASRQEPSQGTTFFAVTSILRVAAEDWKKGDTFSCMVGHEALPLAFTQKTIDR
LAGKPTHVNVSVVMAEVDADPSNNLLPSWAITLISVNGIFVICCLTYCFAPRCRER
RRNERLLRESVRPV

25

5B9-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (nucleotide sequence)

aagcttgccgcatgaggttctctgctcagcttctggggctgcttgtgctctggatccctggatccactgcagataattgtgatgacga
ggctgcattctccaatccagtcactcttgaacatcagcttccatctcctgcaggtctagtaagagctcctacatagtaattggcatca
cttatttgatttggtatctgcagaagccaggccagctcctcagctcctgatttatcagatgtccaacctgcctcaggagtccagaca
30 gggtcagtagcagtggtcaggaaactgattcacactgagaatcagcagagtgagggtgaggatgtgggtgtttattactgtgctc
aaaatctagaactccgctcacgttcggtgctgggaccaagctggagctgaaacgggggtggcgggtggctcgggcgggtgggtgggt

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cgggtggcggcgatcgtcacaggtgcagctgaagcagtcaggacctggcctagtgcagtcctcacagagcctgtccatcacct
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atggagtgggtgaatcacagactataatgcagctttcatatccagactgagcatcaccaaggacgattccaagagccaagtttttt
aaaatgaacagtctgcaacctaataacacagccatttattactgtgccagaaatgggggtgataactacccttattactatgctatgga
5 ctactggggtaaggaacctcagtcaccgtctctctgatcacgtctgtccagggaacttaccctgcccaccgtgaagatcttaca
gtctctctgcgacggcgggcggtcacttccccccaccatccagctctgtgcctcgtctctgggtacccccagggaactatcaac
atcacctggctggaggacgggcaggtcatggacgtggacttgcaccgcctctaccacgcaggaggtgagctggcctccaca
caaagcgagctcacctcagccagaagcactggctgtcagaccgcctacacctgccaggtcacctatcaaggtcacaccttg
aggacagcaccaagaagtgtgcagattccaacccgagaggggtgagcgctacctaagccggcccagccgttcgacctgttca
10 tccgcaagtcgcccacgatcacctgtctgggtgggacctggcaccagcaaggggaccgtgaacctgacctggctccggggcca
gtgggaagcctgtgaaccactccaccagaaggaggagaagcagcgcaatggcacgttaaccgtcacctccacctgcccgtg
ggcacccgagactggatcgagggggagacctaccagtgcaggggtgacccacccccacctgcccagggccctcatcggtcca
cgaccaagaccagcgcccgctgtctccccggaagtctatgcgtttgcgacgcccggagtggccggggagccgggacaagc
gcacctcgcctgcctgatccagaacttcatgcctgaggacatctcgggtgcagtggtgcacaacgaggtgcagctccccggacgc
15 ccggcacagcacgacgcagccccgaagaccaagggtccggcttctctctcagccgcctggaggtgaccagggccgaat
gggagcagaaagatgagttcatctgccgtgcagtcctatgaggcagcgagccctcacagaccgtccagcgagcgggtgtctgtaa
atcccggtaaagcggatcttcgaagctccatcctggccattaccttaatctcagtaaatggaattttgtgatatgctgcctgacct
actgcttgcaccaagatgcagagagagaaggaggaatgagagattgagaagggaagtgtacgcctgtataaatcgata

20 **5B9-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (amino acid sequence)**

MRFSAQLLGLLVLPWIPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHNSGITY
LYWYLQKPGQSPQLLIYQMSNLASGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGSGGGGSGGGSSQVQLKQSGPGLVQSSQSL
ITCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSGGITDYNAAFISRLSITKDDSK
25 SQVFFKMNSLQPNDAIYYCARNGGDNYPIYYAMDYWGQGTSVTVSSDHVCSR
DFTPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTAS
TTQEGELASTQSELTLSQKHWLSDRTYTCQVTYQGHTFEDSTKKCADSNPRGVSA
YLSRPSFDLFIKSPITITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNG
TLTVTSTLPVGTDRDWEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATP
30 EWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKGSGFFVFS
RLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVPNGKADPSKLPSWAITLISV
NGIFVICCLTYCFAPRCRERRRNERLRRESVRPV

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2e12-scFv-IgAH IgA-T4-CD80 (nucleotide sequence)

aagcttatggattttcaagtgcagattttcagcttcctgctaatacagtgcttcagtcataatgtccagaggagtcgacattgtgctcacc
aatctccagcttctttggctgtgtctctaggtcagagagccaccatctcctgcagagccagtgaagtgtgaatattatgtcacaaagt
5 taatgcagtggtaccaacagaaaccaggacagccacccaaactcctcatctctgctgcatccaacgtagaatctggggctccctgcc
aggtttagtggcagtgggctctgggacagacttcagcctcaacatccatcctgtggaggaggatgatattgcaatgtattctgtcagc
aaagtaggaaggttcttgacgttcggaggagccaccaagctggaatcaaacgggggtggcgggtggctcgggcggaggtggg
tcgggtggcggcgatctcaggtgcagctgaaggagtcaggacctggcctggcggcctcacagagcctgtccatcacatgc
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10 atgggggtgatggaagcacagactataattcagctctcaaatccagactgagcatcaccaaggacaactccaagagccaagtttctt
aaaaatgaacagctgcaaactgatgacacagccagatactactgtgccagagatggttatagtaactttcattactatgttatggact
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acgtgcacactgaccggcctgagagatgcctcaggtgtcaccttcacctggacggcctcaagtgggaagagcgctgttcaaggac
15 cacctgacagtgacctctgtggctgtacagcgtgtccagtgctcctgccgggctgtgccgagccatggaacctgggaagaccttc
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acctgctgccgccgccgctggaggagctggccctgaacgagctggtgacgctgacgtgctggcacgtggcttcagccccaag
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ccagggcaccaccaccttcgctgtgaccagcatactgcgctggcagccgaggactggaagaagggggacaccttctcctgcat
20 ggtgggccacgaggccctgccgctggccttcacacagaagaccatcgaccgcttggcgggtaaacccacccatgtcaatgtgtct
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gatatgtgcctgacctactgctttgccccaaagatgcagagagagaaggaggaatgagagattgagaagggaaagtgtacgcct
gtataaatcgatac

25 2e12-scFv-IgAH IgA-T4-CD80 (amino acid sequence)

MDFQVQIFSLLISASVMSRGVDIVLTQSPASLAVSLGQRATISCRASESVEYYVTS
LMQWYQQKPGQPPKLLISAASNVESGVPARFSGSGSGTDFSLNIHPVEEDDIAMYF
CQQSRKVPWTFGGGTKLEIKRGGGSGGGGSGGGGSQVQLKESGPGLVAPSQSL
ITCTVSGFSLTGYGVNWVRQPPGKLEWLGMWGDGSTDYNSALKSRLSITKDNS
30 KSQVFLKMNSLQTDRTARYYCARDGYSNFHYVMDYWGQGTSTVTVSSDQPVPS
TPPTPSPSTPPTPSPSCCHPRLSLHRPALEDLLLGSEAILTCTLTGLRDASGVTFTWTP
SSGKSAVQGPPDRDLGCYSVSSVLPGCAEPWNHKGKTFTCTAAYPESKTPLTATLS

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KSGNTFRPEVHLLPPPSEELALNELVTLTCLARGFSPKDVLRWLQGSQELPREKY
LTWASRQEPSQGTTFFAVTSILRVAEDWKKGDTFSCMVGHEALPLAFTQKTIDR
LAGKPTHVNVSVVMAEVDADPSNNLLPSWAITLISVNGIFVICCLTYCFAPRCRER
RRNERLRRESVRPV

5

2e12-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (nucleotide sequence)

aagcttatggattttcaagtcgagatttcagcttcctgctaatacagtcctcagtcataatgtccagaggagtcgacattgtgtcaccc
aatctccagcttcttggctgtgtctctaggtcagagagccaccatctctgcagagccagtgaagtgttgatattatgtcacaagtt
taatgcagtggtaccaacagaaaccaggacagccacccaaactcctcatctctgctgcaccaacgtagaatctggggtccctgcc
10 aggttttagtggcagtgggctctgggacagacttcagcctcaacatccatctgtggaggaggatgatattgcaatgtatttctgtcagc
aaagtaggaaggttccttggacgttcggcggagggaccaagctggaaatcaaacggggtggcgggtggctcgggcggaggtggg
tcgggtggcggcgatctcaggtgcagctgaaggagtcaggacctggcctggcggcctcacagagcctgtccatcacatgc
accgtctcagggttctcattaaccggctatggtglaaactgggttcgccagcctccaggaaagggtctggagtggctgggaatgat
atggggtgatggaagcacagactataattcagctctcaaattccagactgagcaicaccaaggacaactccaagagccaagtlttct
15 aaaaatgaacagctgcaaactgatgacacagccagatactactgtgccagagatggttatagtaacttcattactatgttatggact
actggggtaaggaacctcagtcaccgtctctcagatcacgtctgtctccagggttcaccccgccaccgtgaagatcttacag
tcgtctcgcagcggcggcggcacttcccccgaccatccagctcctgtgcctcgtctctgggtacaccccagggaactatcaacat
cacctggctggaggacgggcaggtcatggacgtggactgtccaccgcctctaccacgcaggagggtgagctggcctccacac
aaagcgagctcacctcagccagaagcactggctgtcagaccgcacctacacctgccaggtcacctatcaaggtcacaccttga
20 ggacagcaccaagaagtgtgcagattccaacccgagaggggtgagcgcctacctaaagccggcccagcccgttcgacctgttcat
ccgcaagtcgccacgatcacctgtctggtgggtggacctggcaccagcaaggggacctggaacctgacctgtccgggcca
gtgggaagcctgtgaaccactccaccagaaaggaggagaagcagcgaatggcacgttaaccgtcacgtccacctgccggtg
ggcaccggagactggatcgagggggagacctaccagtgcagggtgacccacccccacctgccaggggcctcatcggtcca
cgaccaagaccagcggcccgctgtgctccccggagctatgcgttgcgacgccggagtggccggggagccgggacaagc
25 gcacctcgcctgcctgatccagaactcatgcctgaggacatctcggcgcagtggtgcacaacgaggtgcagctccgggacgc
ccggcacagcacgacgcagccccgaagaccaagggtccggcttctgtcttcagccgcctggaggtgaccaggggccgaat
gggagcagaaagatgagttcatctgccgtgcagtcctatgaggcagcagccccctcacagacctccagcgagcgggtgtctgtaa
atcccggtaaagcggatccttgaagctcccacctgggccattaccttaatctcagtaaatggaattttgtgatatgtgcctgacct
actgctttgccccaaagatgcagagagagaaggaggaatgagagattgagaagggaagtgtacgccctgtataaatcgata

30

2e12-scFv-human IgE Fc (CH2-CH3-CH4)-CD80 (amino acid sequence)

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MDFQVQIFSFLISASVIMSRGVDIVLTQSPASLAVSLGQRATISCRASESVEYYVTS
LMQWYQQKPGQPPKLLISAASNVESGVPARFSGSGSGTDFSLNIHPVEEDDIAMYF
CQQSRKVPWTFGGGTKLEIKRGGGSGGGGSGGGGSQVQLKESGPGLVAPSQSLS
ITCTVSGFSLTGYGVNWVRQPPGKLEWLGMWGDGSTDYNSALKSRLSITKDNS
5 KSQVFLKMNSLQDDTARYYCARDGYSNFHYVMDYWGQGTSTVTVSSDHVCSR
DFTPPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTAS
TTQEGELASTQSELTLQKHWLSDRTYTCQVTYQGHTFEDSTKKCADSNPRGVSA
YLSRPSFDFLIRKSPITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNG
TLTVTSTLPVGTRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATP
10 EWPGRDKRTLACLIQNFMPEISVQWLHNEVQLPDARHSTTQPRKTKSGGFFVFS
RLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGKADPSKLPSWAITLISV
NGIFVICCLTYCFAPRCRERRRNERLRRESVRPV

500A2 scFv (nucleotide sequence)

15 atgttgatacatctcagctccttgggctttactcttctggattcagcctccagaagtacatagtgctgactcagactccagccactc
tgtctctaattcctggagaaagagtcacaatgacctgtaagaccagtcagaatattggcacaatctacactggatcacccaaaacc
aaaggaggtccaagggtctcatcaagtatgcttcgagtcacatcctggatccctccagattcagtgagcagtggtcggaaac
agattcactctcagcatcaataacctggagcctgatgatcggaaatttactgtcaacaagtagaagctggcctgtcacgctc
gtcctggcaccagctggagataaacggggtggcggtggctcggcgagggtgggtggcgggatctcaggtcaa
20 gctgcagcagtcgggttgaactagggaaacctggggcctcagtgaaactgtcctgcaagacttcaggtacatattcacagatc
actatattcttgggtgaaacagaagcctggagaaagcctgcagtgataggaatgtttatggtggaatgggtgacaagctaca
atcaaaaattccagggaaggccacactgactgtagataaaatcttagcacagcctacatggaactcagcagcctgacatctgag
gattctgccatctattactgtgcaagaaggccggtagcgacgggccatgctatggactactggggtcaggggatccaagttaccgt
ctcctctgac

25

500A2 scFv (amino acid sequence)

MLYTSQLLGLLLFWISASRSDIVLTQTPATLSLIPGERVTMTCKTSQNIGTILHWYH
QKPKEAPRALIKYASQSIPGIPSRFSGSGSETDFTLSINNLEPDDIGIYYCQQSRSWPV
TFGPGTKLEIKRGGGSGGGGSGGGGSQVKLQQSGSELGKPGASVKLSCKTSGYIF
30 TDHYISWVKQKPGESLQWIGNVYGGNGGTSYNQKFQGKATLTVDKISSTAYMEL
SSLTSEDSAIYYCARRPVATGHAMDYWGQGIQVTVSSD

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NT

5' oligo:

Name : IgGWT3

GTTGTTTTCGAAGGATCCGCTTTACCCGGAGACAGGGAGAGGCTCTT

5 NT

3' oligo:

Name : hIgGWT5

GTTGTTAGATCTGGAGCCCAAATCTTGTGACAAAACCTCACACATG

NT

10 5' oligo:

Name : FADD5

Sequence

GTTGTGGATCCTTCGAACCCGTTCTTGGTGCTGCTGCACTCGGTGTCG

NT

15 3' oligo:

Name : FADD3

Sequence

GTTGTTATCGATCTCGAGTTATCAGGACGCTTCGGAGGTAGATGCGTC

NT

20 **FADD-CSSCFV (nucleotide sequence)**

gtggatccttgaacccgttctgtgtgctgctgcacitcgggtgtcgtccagcctgtcgagcagcgagctgaccgagctcaagttccta
tgccctcggggcgcgtgggcaagcgcaagctggagcgcgtgcagagcggcctagacctcttccatgctgctggagcagaacga
cctggagcccgggcacaccgagctcctgcgcgagctgctgcctccctcgggcgccacgacctgctgcggcgcgtcgacgact
tcgagggcggggggcggcgccggggccgcgcctggggaagaagacctgtgtgcagcatttaacgtcatatgtgataatgtgggg
25 aaagattggagaaggctggctcgtcagctcaaagtctcagacaccaagatcgacagcatcgaggacagataaccccgcaacctg
acagagcgtgtgcgggagtcactgagaatctggaagaacacagagaaggagaacgcaacagtggcccacctgggtgggggctc
tcaggtcctgccagatgaacctgggtggctgacctggtacaagagggtcagcaggcccgtgacctccagaacaggagtggggcca
tgtccccgatgtcatggaactcagacgcactctacctccgaagcgtcctgataactcgagatcgataaacaac

30 **FADD-CSSCFV (amino acid sequence)**

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5

GTTGTGGATCCTCCCTTTTGGGTGCTGGTGGTGGTTGGTGTCTTGGCTTGCTAT
AGCTTG

GTTGTTTCGAACCCAGAAAATAATAAAGGCCACTGTTACTAGCAAGCTATAGC
AAGCCAG

15 GTTGTGGATCCTCCCTTTTGGGGTGCTGGTGGT

GTTGTTTCGAACCCAGAAAAATAATAAAGGCCAC

GTTGTGGATCCTCCTGCTCCCATCCTGG

25 GTTGTTTCGAACGGCAAAGCAGTAGGTCAGGC

GTTGTGGATCCTTCGAACCCATTCCTGGTGCTGCTGCACTCGCTG

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MFADD3XC (nucleotide sequence)

GTTGTTATCGATCTCGAGTCAGGGTGTCTTCTGAGGAAGACAC

- 5 **Murine FADD nucleotide sequence** (full length, but without flanking -Ig or transmembrane sequences) (nucleotide sequence)

gtggatccttgaacatggaccattcctggtgctgctgcactcgtgtccggcagcctgtcgggcaacgatctgatggagctcaa
gtttctgtccgcgagcgcgtgagcaaacgaaagctggagcgcgtgcagagtggcctggacctgttcacgggtgctgctggagca
gaacacctggagcgcgggcacaccgggctgctgcgcgagttgctggcctcgtgcgccgacacgatctactgcagcgcctgg
10 acgacttcgaggcggggacggcgaccgctgcgccccgggggaggcagatctgcaggtggcatttgacattgtgtgtgacaatg
tggggagagactggaaaagactggcccgcgagctgaaggtgtctgaggccaagatggatgggattgaggagaagtacccccg
aagtctgagtgaaggtaaggagagctctgaaagtctggaagaatgctgagaagaagaacgcctcgggtggccggactggtca
aggcgtcgcggacctgcaggctgaatctggtggctgacctggtggaagaagcccaggaatctgtgagcaagagtgagaatatgt
ccccagtactaagggttaactgtgttctcctcagaaacacctgactcgagatcgat

15

Murine FADD (amino acid sequence)

VDPSNMDPFLVLLHSLSGSLSGNDLMELKFLCRERVSKRKLERVQSGLDLFTVLLE
QNDLERGHTGLLRELLASLRRHDLQRLDDFEAGTATAAPPGEADLQVAFDIVCD
NVGRDWKRLARELKVSEAKMDGIEEKYPRSLSERVRESLKVWKNAEKKNASVA
20 GLVKALRTCRLNLVADLVEEAQESVSKSENMSPVLRDSTVSSSETP

MCASP3-5 (nucleotide sequence)

GTTGTGGATCCTTCGAACATGGAGAACAACAAAACCTCAGTGGATTCA

- 25 **MCASP3-3 (nucleotide sequence)**

GTTGTTATCGATCTCGAGCTAGTGATAAAAGTACAGTTCTTTTCGT

MCASP8-5 (nucleotide sequence)

GTTGTTTCGAACATGGATTTCAGAGTTGTCTTTATGCTATTGCTG

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MCASP8-3 (nucleotide sequence)

GTTGTTATCGATCTCGAGTCATTAGGGAGGGAAGAAGAGCTTCTTCCG

5 **hcasp3-5(nucleotide sequence)**

GTTGTGGATCCTTCGAACATGGAGAACACTGAAAACTCAGTGGAT

hcasp3-3 (nucleotide sequence)

GTTGTTATCGATCTCGAGTTAGTGATAAAAATAGAGTTCTTTTGTGAG

10

hcasp8-5 (nucleotide sequence)

GTTGTGGATCCTTCGAACATGGACTTCAGCAGAAATCTTTATGAT

hcasp8-3 (nucleotide sequence)

15 GTTGTTATCGATGCATGCTCAATCAGAAGGGAAGACAAGTTTTTTTCT

1. 2H7 scFv with alternative VHL11 mutations:

Nucleotide sequence

20 Aagcttgccgccatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgtctc
tcccagctcagcaatcctgtctgcatctccaggggagaaggtcacaatgactgcagggccagctcaagtgaagttacatgcac
tggtaccagcagaagccaggatcctcccccacccctggatttatgcccacccaacctggcttctggagtcctgctcgttcagt
ggcagtggtctgggacctctactcttcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggag
ttaaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtgctgggcgggtggtggtatctggaggaggt
gggagctctcaggcttatctacagcagctctggggtgag (one of the following: tcn, acn, gan, can, aan,
25 **cgn, agn**)
gtgaggcctggggcctcagtgaaatgtcctgcaaggcttctggctacacattaccagttacaatatgcactgggtaaagcagaca
cctagacagggcctggaatggattggagctatttatccaggaaatggtgatacttctacaatcagaagttcaagggaaggccac
actgactgtagacaaaatcctccagcacagcctacatgcagctcagcagcctgacatctgaagactctgcggtctatttctgtgcaag
agtggtgtactatagtaactcttactggtacttcgatgtctggggcacagggaccacggtcaccgtctcttctgatcag

30

Amino acid sequence

25 MDFQVQIFSLLISASVIIARGQIVLSQSPAILSPGKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAE (one of the following:
35 **S, T, D, E, Q, N, R, K, H**)
VRPGASVKMSCKASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFK

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GKATLTVDKSSSTAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVT
VSSDQ

2. VHL11 deletion

5 Nucleotide sequence:

Aagcttgcgcgatggatttcaagtgcagatttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgtctc
tccagctctccagcaatcctgtctgcatctccaggggagaaggtcacatgacttcagggccagctcaagtgttaagttacatgcac
tggaccagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagt
ggcagtggtctgggacctctactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggag
10 ttaaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtggtggatctggaggaggt
gggagctctcaggcttatctacagcagctctggggctgaggtgagggcctcagtgaaagatgctcgaaggtctctggct
acacattaccagttacaatagcactgggtaaagcagacacctagacagggcctggaatgagtgagctattatccaggaaatg
gtgatacttctacaatcagaagttcaagggcaagggcacactgactgtagacaaatcctccagcagacgtacatgcagctcagc
agcctgacatctgaagactctgcggtctatttctgtgcaagagtggtgtactatagtaactcttactggacttcgatgtctggggcaca
15 gggaccacggtcaccgtctctctgatcag

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
20 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAEVRPGASVKMSCKA
SGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSST
AYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDQ

3. 2H7 VL L106 with alternative mutations

25 Nucleotide sequence:

aagcttgcgcgatggatttcaagtgcagatttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgtctc
cccagctctccagcaatcctgtctgcatctccaggggagaaggtcacatgacttcagggccagctcaagtgttaagttacatgcact
ggaccagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagt
gcagtggtctgggacctctactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggatt
30 taaccacccacgttcggtgctgggaccaagctggag (tcn, agn, aan, cgn, can, gan, and non-natural
derivatives of these codons) aaagatggcgggtggctcggcggtggtggatctggaggaggtgggagctc

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
35 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLE (S, T, R, K, H, Q, N, D, E, and non-natural derivatives of these
amino acids at position 106)KDGGGSGGGGSGGGGSS

4. VL L106 deletion

40 Nucleotide sequence:

Aagcttgcgcgatggatttcaagtgcagatttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgtctc
tccagctctccagcaatcctgtctgcatctccaggggagaaggtcacatgacttcagggccagctcaagtgttaagttacatgcac
tggaccagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagt
ggcagtggtctgggacctctactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggag
45 ttaaccacccacgttcggtgctgggaccaagctggagaaagatggcgggtggctcggcggtggtggatctggaggaggtgg
gagctc

Amino acid sequence:

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MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLEKDGGGSGGGGSGGGGSS

5 **5. IgE CH3 CH4**

Nucleotide sequence:

tccaacccgagaggggtgagcgccctacctaagccggccagcccgttcgacctgttcacccgcaagtcgcccacgatcacctgtc
tggtggtggacctggcaccagcaaggggaccgtgaacctgacctggtccggccagtggaagcctgtgaacctccacc
agaaaggaggagaagcagcgcgaatggcacgttaacctgacgtccacctgcccgtgggacccgagactggatcgaggggg
10 agacctaccagtgagggtgacccacccacacgtgcccagggccctcatgcggtccacgaccaagaccagcggcccgctgct
gccccggaagtctatgcgttgcgacggcggagtgccggggagccgggacaagcgacccctgcctgctgatccagaactt
catgctgaggacatctggtgcagtggctgcacaacgaggtgcagtcctccggacgcccggcacagcagcagcagccccgc
aagaccaagggtccggcttctgcttccagccgctggaggtgaccagggccgaatgggagcagaagatgagttcatctgcc
gtgcagtcctatgaggcagcgagccctcacagaccgtccagcgagcgggtgtctgtaaatcccggtaatgataatctagaa

15

Amino acid sequence:

SNPRGVSAYLSRPSPFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTR
KEEKQRNGTLTVTSTLPVGTRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAA
PEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRK
20 TKGSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGK

6. hIgG1H/IgE WCH3 WCH4

Nucleotide sequence:

tgatcaggagcccaaatctctgacaaaactcacacatccccaccgtccccagcatccaacccgagaggggtgagcgccctaccta
25 agccggcccagcccgttcgacctgttcacccgcaagtcgcccacgatcacctgtctggtggtggacctggcaccagcaagggg
accgtgaacctgacctggtccgggcccagtggaagcctgtgaacctccaccagaaaggaggagaagcagcgcgaatggca
cgtaaacgtcacgtccacctgcccgtgggcccagcagactggatcgagggggagacctaccagtgagggtgacccacccc
cacctgcccagggccctcatgcggtccacgaccaagaccagcggcccgcgtgctgccccggaagtctatgcgttgcgacgcc
ggagtgccggggagccgggacaagcgacccctgcctgctgatccagaactcatgctgaggacatctcggtgcagtggct
30 gcacaacgaggtgcagtcctccggacgcccggcacagcagcagcagcagcccgcaagaccaagggtccggcttctcgtcttca
gccgctggaggtgaccagggccgaatgggagcagaaagatgagttcatctgccgtgcagtcctatgaggcagcgagccctca
cagaccgtccagcgagcgggtgtctgtaaatcccggtaatgataatctagaa

Amino acid sequence:

DQEPKSSDKTHTSPPSPASNPRGVSAYLSRPSPFDLFIRKSPTITCLVVDLAPSKGTV
35 NLTWSRASGKPVNHSTRKEEKQRNGTLTVTSTLPVGTRDWIEGETYQCRVTHPHL
PRALMRSTTKTSGPRAAPEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLH
NEVQLPDARHSTTQPRKTKGSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQT
VQRAVSVNPGK

40

7. IgE WCH2 WCH3 WCH4

Nucleotide sequence:

Tgatcagctctgtccaggacttcacccgcccaccgtgaagatcttacagtcgtcctgcgacggcggcgggacacttcccccg
accatccagctcctgtgctcgtcttggtacacccagggaactcaacatcacctggctggaggacgggcaggtcatggacg
45 tggactgtccaccgcctctaccacgcaggaggtgagctggcctccacaaagcgagctcacctcagccagaagcactggc
tgtcagaccgcacctacacctgccaggtcacctatcaaggtcacaccttgaggacagcaccagaaggtgtgcagattccaaccc
gagaggggtgagcgccctacctaagccggcccagcccgttcgacctgttcacccgcaagtcgcccacgatcacctgtctggtggtg
gacctggcaccagcaaggggaccgtgaacctgacctggtccgggcccagtggaagcctgtgaacctccaccagaaagg
aggagaagcagcgcaatggcacgttaacctgcagtcacacctgcccgtgggcccagcagactggatcgagggggagacctta
ccagtgagggtgacccacccacacacgtgcccagggccctcatgcggtccacgaccaagaccagcggcccgcgtgctgccccg
50 gaagtctatgcgttgcgacggcggagtgccggggagccgggacaagcgacccctgcctgctgatccagaactcatgct

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gaggacatctcggtagcagtggtgcacaacgaggtgcagctcccgagcggcgacagcagcagcagcccgcaagacc
aagggtccggcttctcgtctcagccgcctggaggtgaccaggccgaatgggagcagaaagatgagttcatctgccgtgcag
tccatgaggcagcagccctcacagaccgtccagcgagcgggtgtctgtaaatcccggtaaatgataatctaga

5 Amino acid sequence:
DHVCSRDFTPPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDV
DLSTASTTQEGELASTQSELTLSQKHWLSDRTYTCQVTYQGHTFEDSTKKCADSN
PRGVSAAYLSRPSFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKE
EKQRNGTLTVTSTLPVGTDRDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPE
10 VYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDAHSTTQPRKTK
GSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGK

8. hIgG1H/IgE CH3 CH4 (ORF)

Nucleotide sequence:

15 tgatcaggagcccaaatctctgacaaaactcacacatccccaccgtccccagcatccaaccgagaggggtgagcgcclaccta
agccggcccgagcccggttcgacctgttcacccgaagtcgcccacgacacctgtctggtggtgacctggcaccagcaagggg
accgtgaacctgacctggtcccgggccagtggaagcctgtgaaccactccaccagaaaggaggagaagcagcgcaatggca
cgtaaccgtcacgtccacctgcccgtgggacccgagactggatcgagggggagacctaccagtgcagggtgacctacccc
cacctgcccaggggccctcatgctccacgaccaagaccagcggcccgctgtctgccccggaagtctatgctgttcgacgcc
20 ggagtgccggggagccgggacaagcgcacctcgcctgcctgatccagaacttcacgtcctgaggacatctcgtgcagtggt
gcacaacgaggtgcagctcccgagcggcgacggcgacagcagcagcagcagcccgcaagaccaagggctccggttctcgtctca
gcccctggaggtgaccaggccgaatgggagcagaaagatgagttcatctgccgtgcagtcctgaggcagcgagccctca
cagaccgtccagcgagcgggtgtctgtaaatcccggtaaagcgatccttcgaa

25 Amino acid sequence:
DQEPKSSDKTHTSPSPASNPRGVSAAYLSRPSFDLFIRKSPTITCLVVDLAPSKGTV
NLTWSRASGKPVNHSTRKEEKQRNGTLTVTSTLPVGTDRDWIEGETYQCRVTHPHL
PRALMRSTTKTSGPRAAPEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLH
NEVQLPDAHSTTQPRKTKGSGFFVFSRLEVTRAWEQKDEFICRAVHEAASPSQT
30 VQRAVSVNPGKSGSFE

9. 2H7 VHL11S scFv hIgG1(SSS-S)H hIgE WCH3 WCH4

Nucleotide sequence:

35 aagcttcccgcattgatttcaagtgagatttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgtctct
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ggtaccagcagaagccaggatctccccaaacctggatttatccccatcaacctggcttctggagtcctctgctcgttcagtg
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taaccacccacgttcggtgctgggaccaagctggagctgaagatggcgggtgctcggcggtggtgagtgagtg
ggagctctcaggcttatctacagcagctctggggctgagtcggtgaggcctggggcctcagtggaagatgctcgaaggcttctggc
40 tacacattaccagttacaatatgactgggtaaacgagacacctagacagggcctggaatggattggagctatttatccaggaat
ggtgatacttctacaatcagaagttaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtgactatagtaacttactggctactcagatgctggggc
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45 ggacctggcaccagcaaggggacctgaacctgacctggctccggggcagtggaagcctgtgaaccactccaccagaag
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50 aagggtccggcttctcgtctcagccgcctggaggtgaccaggccgaatgggagcagaaagatgagttcatctgccgtgcag
tccatgaggcagcagccctcacagaccgtccagcgagcgggtgtctgtaaatcccggtaaatgataatctaga

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5
10

MDFQVQIFS^ALLISASV^AIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPW^ATYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPTTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
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TAYMQLSSLTSEDSAVYFCARVVYYSNSYWYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSASNPRGVSAYLSPSPFDLFIRKSPTITCLVVDLAPSKGTVNLTWSRASG
KPVNHSTRKEEKQRNGTLTVTSTLPVGT^ARDWIEGETYQCRVTHPHLPRALMRSTT
KTSGPRAAPEVYAFATPEWPGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDAR
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GK

15

aagcttgcgcgcattgatttcaagtgcagattttcagcttctgctaatacagtgcttcagtcataaattgccagaggcaaaattgttctt
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 25 cagcctgacatctgaagacitctcgggtctatttctgtgcaagagtggtgtactatagtaactcttactggtaactctgatgtctggggcac
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 30 accagtgagggtgacccacccacactgccagggccctcatgcggtccacgaccaagaccagcggcccgctgctgcccc
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 aagggtctccggtcttctgcttccagccctggaggtgaccagggccgaatgggagcagaanaagatgagttatctgccgtgag
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40 MD FQ V Q I F S F L L I S A S V I I A R G Q I V L S Q S P A I L S A S P G E K V T M T C R A S S S V S Y M H W Y
Q Q K P G S S P K P W I Y A P S N L A S G V P A R F S G S G S G T S Y S L T I S R V E A E D A A T Y Y C Q Q W S
F N P P T F G A G T K L E L K D G G G S G G G S G G G G S S Q A Y L Q Q S G A E S V R P G A S V K M S C K
T A Y M Q L S S L T S E D S A V Y F C A R V V Y Y S N S Y W Y F D V W G T G T T V T V S S D Q E P K S S D K
T H T S P P S P A S N P R G V S A Y L S R P S P F D L F I R K S P T I T C L V V D L A P S K G T V N L T W S R A S G
K P V N H S T R K E E K Q R N G T L T V T S T L P V G T R D W I E G E T Y Q C R V T H P H L P R A L M R S T T
K T S G P R A A P E V Y A F A T P E W P G S R D K R T L A C L I Q N F M P E D I S V Q W L H N E V Q L P D A R
45 H S T T Q P R K T K G S G F F V F S R L E V T R A E W E Q K D E F I C R A V H E A A S P S Q T V Q R A V S V N P
G K

50 aagcttgccgccatggatttcaagtgagatttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctt
ccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatactgagggccagctcaagtgttaagttacatgcaact
gtaccagcagaagccaggatctctccccaacccctggatttatgcccatccaacctggcttctggagtcctgtctgcttcagtg

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gcagtgggtctgggacctcttactcttcacaatcagcagagtggaggtgaagatgctgccacttattactgccagcagtgaggtt
taaccacccacggtcgggtctgggaccaagctggagctgaaagatggcgggtggctcggcggtggtgagctggaggaggtg
ggagctc

5 Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLESKDGGGSGGGGSGGGGSS

10 11. 2H7 VL L106S scFv

Nucleotide sequence:

aaagcttgcgccatggatttcaagtgcagatttcagcttctgtaatacagtgcttcagtcataattgccagaggacaaattgttctc
cccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgaagttacatgcact
gggtaccagcagaagccaggatcctccccaaccctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagtg
15 gcagtgggtctgggaccttactcttcacaatcagcagagtggaggtgaagatgctgccacttattactgccagcagtgaggtt
taaccacccacggtcgggtctgggaccaagctggagcttaagatggcgggtggctcggcggtggtgagctggaggaggtg
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gggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
20 cagcctgacatctgaagactctgcggctctatttctgtgcaagagtgggtgactatagtaactcttactggtacttcgatgtctggggc
agggaccacgggtcaccgtctctctgatcag

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
25 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLESKDGGGSGGGGSGGGGSSQAYLQQSGAELVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDQ

30 12. 2H7 scFv VL L106S VHL11S scFv

Nucleotide sequence:

Aagcttgcgccatggatttcaagtgcagatttcagcttctgtaatacagtgcttcagtcataattgccagaggacaaattgttctc
tccagcttccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgaagttacatgcac
tggtaccagcagaagccaggatcctccccaaccctggatttatgccccatccaacctggcttctggagtcctctgctcgttcagtg
35 ggcagtggtctgggaccttactcttcacaatcagcagagtggaggtgaagatgctgccacttattactgccagcagtgaggt
ttaaccacccacggtcgggtctgggaccaagctggagcttaagatggcgggtggctcggcggtggtgagctggaggaggt
gggagctctcaggttatctacagcagctctggggctgagctggtgaggcctggggcctcagtgaaagatgctcgaaggtctctg
gctacacattaccagttacaatagcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaa
atgggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctc
40 agcagcctgacatctgaagactctgcggctctatttctgtgcaagagtgggtgactatagtaactcttactggtacttcgatgtctggggc
acagggaccacgggtcaccgtctctctgatcag

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
45 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLESKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDQ

50 10. Human IgD hinge linker with attached restriction sites

Nucleotide:

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gtggatccaggttcgaagtctccaaaggcacaggcctcctccgtgccactgcacaacccccagcagagggcagcctcgccaa
ggcaaccacagccccagccaccaccgtaacacaggaagaggaggagaagagaagaagaaggagaaggagaagaggaa
caagaagagagagagacaaagaccggcgagtcgacg

- 5 Amino acid:
VDPGSKSPKAQASSVPTAQPQAEGSLAKATTAPATTRNTGRGGEEKKKKEKEKEEQ
EERETKTGAVD

Sequence of Native IgD hinge domain:

- 10 (includes a cysteine residue—we truncated the hinge prior to that residue for these
constructs:)

Nucleotide:

- gagtcctcaaaggcacaggcctcctccgtgccactgcacaacccccagcagagggcagcctcgccaaggcaaccacagccc
cagccaccaccgtaacacaggaagaggaggagaagagaagaagaaggagaaggagaagaggacaagaagagagaga
15 gacaaagacaccagagtgtccgagccacaccgcctcttggcgctctacctgctaaccct

Amino acid sequence:

- ESPKAQASSVPTAQPQAEGSLAKATTAPATTRNTGRGGEEKKKKEKEKEEQEERET
KTPECPSHTQPLGVYLLTP
20

12. 2H7 VH L11S

Nucleotide sequence:

- caggcttatctacagcagtcctggggctgagtcggtagggcctggggcctcagtgaaatgtcctgcaaggctctggtacacattt
accagttacaatatgcactgggtaaacgagacacctagacagggcctggaatggattggagctatttatccaggaaatggatgatact
25 tctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcagcagcctga
catctgaagactctgcggtctatttctgtgcaagagtgggtactatagtaactcttactggctcctgatgtctggggcacaggagacc
acggtcaccgtctcttct

Amino acid sequence:

- 30 QAYLQQSGAESVRPGASVKMSCKASGYTFTSYNMHWVKQTPRQGLEWIGATYPG
NGDTSYNQKFKGKATLTVDKSSSTAYMQLSSLTSEDSAVYFCARVVYYNSYWY
FDVWGTGTTVTVSS

13. 2H7 VH L11S scFv

- 35 Nucleotide sequence:

- aagcttccgccatggatttcaagtcagatttcagcttcctgctaatacagtcgttcagtcataattgccagaggacaaattgttctct
cccagctcaccagcaatcctgtctgcactcaccaggggagaaggtcacaatgacttcagggccagctcaagtgaagtacatgcact
ggtagcagcagaagccaggtatcctccccaacccctggatttatccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtggtgtctgggacctcttactctctcacaatcagcagagtgagggtgaagatgtgccacttattactgccagcagtgagatt
40 taaccacccacgttcgggtgctgggaccaagctggagctgaaagatggcgggtggctcgggcgggtggatctggaggaggtg
ggagctctcaggcttatctacagcagtcctggggctgagtcggtagggcctggggcctcagtgaaatgtcctgcaaggctctggc
tacacattaccagttacaatatgcactgggtaaacgagacacctagacagggcctggaatggattggagctatttatccaggaaat
gggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtactatagtaactcttactggtagctgatgtctggggcac
45 agggaccacggtcaccgtctcttctgatcag

Amino acid sequence:

- MDFQVQIFSLLISASVIIARGQIVLSQSPAILSPSPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
50 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK

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14. 2H7 scFv VH L11S hIgG1 (CSC-S)H WCH2 WCH3

aagcttgcgcgcatggaatttcaagtcagcagattttagcgttctgtcataatcagtgcttcagtcataattgccagaggacaaattgtctct
 cccagctccagcaaatctgtctgcatctccaggggagaaagctcacaatgacttgcagtgccagcagctcaagtgtaatattacgtcact
 ggtaccagcagaagccaggatctctccccaaccctggatttatgccccatccaacctggctctggagtcctgtctgcttcagt
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MDFQVQIFSL¹LISASVILARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSS
 TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSCDK
 THTSPPCSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWY
 VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
 EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
 NNYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSL
 SPGK

15. 2H7 scFv VH L11S IgE WCH2 WCH3 WCH4

40 aagcttgccgccatggatttcaagtgcagattttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
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ggcggcgggcaacttcccccgaccatccagctcctgtgctcgtctctgggtacacccagggaactatcaacatccctggtctgg
50 aggacgggcaggtcatggacgtggactgtccaccgcctctaccacgcaggagggtgagctggcctccacacaaagcgagctc
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agaagtgtgcagattccaacccgagaggggtgagcgctacctaagccggccagcccgttcacgtgttcacgcaagtcgc
ccacgatcacctgtctgggtggacctggcaccagcaaggggaccgtgaacctgacctgggtccggggccagtgggaagcct
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acgacgcagccccgcaagaccaagggtccggcttctctgctctcagccgctggaggtgaccagggccgaatgggagcagaa
agatgagttcatctgcccgtgcagtcctatgaggcagcgagccctcacagaccgtccagcgagcggtgtctgtaaatcccggtaaa
tgataatctaga

10

Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
15 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTTVTVSSDHVCSRDF
PPTVKILQSSCDGGGHFPPTIQLLCLVSGYTPGTINITWLEDGQVMDVDLSTASTTQ
EGELASTQSELTLSQKHWSLDRITYTCQVTYQGHTFEDSTKKCADSNPRGVSA YLS
RPSFDLFIKRSPTITCLVVDLAPSKGTVNLTWSRASGKPVNHSTRKEEKQRNGTLT
20 VTSTLPVGT RDWIEGETYQCRVTHPHLPRALMRSTTKTSGPRAAPEVYAFATPEW
PGSRDKRTLACLIQNFMPEDISVQWLHNEVQLPDARHSTTQPRKTKGSGFFVFSRL
EVTRAWEQKDEFICRAVHEAASPSQTVQRAVSVNPGK

16. 2H7 scFv VH L11S mIgE WCH2 WCH3 WCH4

25 Nucleotide sequence:

aagcttgcgccatggatttcaagtgcagatttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagctctccagcaatcctgtctgcatctccaggggagaaggtcacatgactgcagggccagctcaagtgaagtacatgcact
ggtagcagcagaagccaggtacctccccaaacctggattatgccccatcaacctggctctgagtcctctgctcgttcagtg
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30 taaccacccacgttcgtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtgggtgagctggaggagtg
ggagctctcaggttatctacagcagctggggctgagctgtgaggcctggggcctcagtgaaagatgctctgcaaggcttctggct
acacatttaccagttacaatatgcactgggtaaagcagacacctagacagggcctggaatggattggagctatttaccaggaaatg
gtgatacttctacaatcagaagttcaagggaagggcacactgactgtagacaaatctccagcacagcctacatgcagctcagc
agcctgacatctgaagactctgcggtctatttctgtgcaagagtggtgtactatagtaactcttactgttacttcgatgtctggggcaca
35 gggaccacggtcaccgtctctctgatcaggttcgacctgtcaacatcactgagcccacctggagctactccattcatcctgcgacc
ccaatgcattccactccaccatccagctgtactgttctattatggccacatcctaataatgatgtctctgtcagctggctaattggacgatc
gggagataactgatacacttgacaaaactgttctaatacaggaggaaggcaactagcctctacctgcagtaaaactcaacatcactg
agcagcaatggatgtctgaaagcaccctcacctgcaaggtcacctcccaaggcgtagactatttggccacactcgagatgccc
gatcatgagccacggggtgtgattacctacctgatccaccagccccctggacctgtatcaaaacgggtgtcccaagcttacctgt
40 ctggtggtggacctggaaagcgagaagaatgtcaatgtgacgtggaaccaagagaagaagacttcagctcagcatccagtggt
acactaagcaccacaataacgccacaactagatcacctccatctgcctgtagttgccaaggactggattgaaggctacggctatc
agtgcatagtggaccacctgatttcccaagccattgtgcgttccatcaccaagacccccagggcagcgtcagccccggagga
tatgtgttccaccaccagaggaggagagcgaggacaaacgcacactcacctgtttgatccagaactcttccctgaggatattct
gtgcagtggtgggggatggcaactgatctcaaacgccagcagcagtagccacaacacccctgaaatccaatggctccaatcaa
45 ggcttcttcatcttcagtcgcttagaggtcgccaagacactctggacacagagaaaacagttcacctgccaagtgtccatgaggc
acttcagaaacccaggaaactggagaaaacaatatccacaagccttggtaacacctccctccgtccatcctagtaatactagag

Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
50 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK

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ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDHVRPVNIT
EPTLELLHSSCDPNAFHSTIQLYCFIYGHILNDVSVSWLMDDREITDTLAQTVLIKE
EGKLASTCSKLNITEQQWMSESTFTCKVTSQGVVDYLAHTRRCPDHEPRGVITYLIP
5 PSPLDLYQNGAPKLTCLVVDLESEKNVNVTVNQEKKTSVSASQWYTKHHNNATT
SITSILPVVAKDWIEGYGYQCIVDHPDFPKPIVRSITKTPGQRSAPENVYVFPPEESEE
DKRTLTLCLIQNFFPEDISVQWLGDGKLISNSQHSTTTPLKSNQNGFFIFSRLEVAK
TLWTQRKQFTCQVIHEALQKPRKLEKTISTSLGNTSLRPS

10 **17. 2H7 scFv VH L11S hIgA WH WCH2 T4CH3**

Nucleotide sequence:

aagcttgcgcgcattgatttcaagtcagatttcagcttctgctaatacagtcgttcagtcataattgccagaggacaaaattgttctct
cccagctccagcaatcctgtctgcatctccaggggagaaaggtcacatgacttcagggccagctcaagtgtaagtacatgcact
ggtagcagcagaagccaggtacctccccaaacctggatttatgccccatcaacctggcttctggagtcctctgctcgttcagtg
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20 agcctgacatctgaagactctgcggctctatttctgtgcaagagtggtgtactatagtaactcttactgtacttcgatgtctggggcaca
gggaccacggtcaccgtctctctgatcagccagttccctcaactccacctacccatctccctcaactccacctacccatctccct
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accggcctgagagatgctcaggtgtcaccttcacctggacgccctcaagtgggaagagcgtgttcaaggaccacctgaccgtg
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25 gcttaccggaggtccaagaccccgctaaccgccacctctcaaaatccggaaacacattccggcccgaggtccacctgctgccg
ccggcgtcggaggagctggccctgaacgagctggtgacgctgacgtgcctggcacgtggcttcagccccagagatgtgtgtgtt
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ccaccttcgctgtgaccagcactgctgcgtggcagccgaggactggaagaagggggacaccttctctgcatggtggggccacg
aggccctgccgctggccttcacacagaagaccatcgaccgcttggcgggtaaacccaccatgtcaatgtgtctgttgcacgtggcg
30 gaggtgactgataatctaga

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYIAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
35 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQVPVSTPPT
PSPSTPPTPSPSCCHPRLSLHRPALEDLLLGSEAILTCTLTGLRDASGVITFTWTPSSG
KSAVQGGPPDRDLGCGYSVSSVLPGCAEPWNHKGKTFCTAAYPESKTPLTATLSKS
40 GNTFRPEVHLLPPPSEELALNELVTLTCLARGFSPKDVLRWLQGSQELPREKYLT
WASRQEPSQGTTFFAVTSILRVAEDWKKGDTFSCMVGHEALPLAFTQKTIDRLA
GKPTHVNVSVVMAEVD

18. 2H7 scFv VH L11S mIgA WH WCH2 T4 CH3

45 Nucleotide sequence:

aagcttgcgcgcattgatttcaagtcagatttcagcttctgctaatacagtcgttcagtcataattgccagaggacaaaattgttctct
cccagctccagcaatcctgtctgcatctccaggggagaaaggtcacatgacttcagggccagctcaagtgtaagtacatgcact
ggtagcagcagaagccaggtacctccccaaacctggatttatgccccatcaacctggcttctggagtcctctgctcgttcagtg
gcagtggtgtctgggaccttactctctcacaatcagcagagtgaggagctgaagatgctgccacttattactgccagcagtgagattt
50 taaccacccacggtcgggtgctgggaccaagctggagctgaaagatggcgggtgctcgggcgggtggtggtatctggaggaggtg
ggagctctcaggcttatctacagcagctctggggctgagctctgtagggcctggggcctcagtgaaagatgctctgcaaggcttctggct

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acacatttaccagttacaatatgcactgggtaaagcagacacctagacaggcctggaatggattggagctatttatccaggaaatg
gtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcagacgtacatgcagctcagc
agcctgacatctgaagactctcggtctatttctgtgcaagagtgggtactatagtaactcttactggtactctgatgtctggggcaca
gggaccacggtcaccgtctctctgatcacatctgttctcctactactcctcctccaccttctgccagcccagcctgtcactgca
5 gcgccagctcttgaggacgtgctcctgggttcagatgccagcatcacatgtactctgaatggcctgagagatcctgagggagctg
tcttcacctgggagccctccactgggaaggatgcagtgacagaagaagctgtgcagaattcctcggtctgacagtggtccagc
gtcctgcctggctgtgtgagcgtggaacagtggcgcatcattcaagtgcacagttaccatcctgagctgtacaccttaactggc
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ctcgtgtccctgacatgctggtgcgagcttcaaccctaaagaagtgtggtgcgatggctgcaggaatgaggagctgtcccc
10 agaaagctacctagtgtttgagcccctaaaggagccagggcagggagccaccacctacctggtgacaagcgtgtgcgtgtatca
gctgaaatctggaacagggtgaccagtactcctgcagtggtggccacgaggccttgcccatgaacttcaccacagaagaccatcg
accgtctgtcgggtaaaccaccaatgtcagcgtgtctgtgatcatgtcagaggagattgataatctagat

Amino acid sequence:

15 MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTISYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDHICSPPTTP
20 PPPSCQPSLSLQRPALDLLLLGSDASITCTLNGLRDPEGAVFTWEPSTGKDAVQKK
AVQNSCGCYSVSSVLPGCAERWNSGASFKCTVTHPESDTLTGTLAKVTVNTFPPQV
HLLPPPSEELALNELVSLTCLVRAFPNKEVLVRWLHGNEELSPESYLVEPLKEPGE
GATTYLVTSVLRVSAEIWKQGDQYSCMVGHEALPMNFTQKTIDRLSGKPTNVSVS
VIMSEGD

25

A. mIgA WCH2 T4CH3

Nucleotide sequence:

Gttgtgatcacatctgttctcctactactcctcctccaccttctgccagcccagcctgtcactgcagcggccagctcttgagga
cctgctcctgggttcagatgccagcatcacatgtactctgaatggcctgagagatcctgagggagctgtcttcacctgggagccctc
30 cactgggaaggatgcagtgacagaagaagctgtgcagaattcctcggtctgtacagtggtccagcgtcctgcctgctgtgtg
agcgttggaacagtggcgcatcattcaagtgcacagttaccatcctgagctgtacaccttaactggcacaattgccaaagtcaca
gtgaacaccttccaccccaggtccacgtgtaccgccgctcggaggagctggccctgaatgagctcgtgtccctgacatgcc
tggtgcgagcttcaaccctaaagaagtgtggtgcgatggctgcaggaatgaggagctgtccccagaaagctacctagtgtttg
agcccctaaaggagccagggcagggagccaccacctacctggtgacaagcgtgtgtgcgtgtatcagctgaaatctggaacagg
35 gtgaccagtactcctgcagtggtggccacgaggccttgcccatgaacttcaccacagaagaccatcgaccgtctgtcgggtaaacc
cacaatgtcagcgtgtctgtgatcatgtcagaggagattgataatctagat

Amino acid sequence:

40 DHICSPPTTPPPSCQPSLSLQRPALDLLLLGSDASITCTLNGLRDPEGAVFTWEPST
GKDAVQKKAVQNSCGCYSVSSVLPGCAERWNSGASFKCTVTHPESDTLTGTLAKV
TVNTFPPQVHLLPPPSEELALNELVSLTCLVRAFPNKEVLVRWLHGNEELSPESYL
VFEPLKEPGE GATTYLVTSVLRVSAEIWKQGDQYSCMVGHEALPMNFTQKTIDRL
SGKPTNVSVSVIMSEGD

45 20. K322S CH2 region

Nucleotide sequence:

cctgaactcctgggggaccgtcagttcttcttccccccaaacccaaggacacctcatgatctcccggaccctgaggtcac
atgcgtgggtggagctgagccacgaagacctgaggtcaagttaactgggtacgtggacggcgtggaggtgcataatgcaa
gacaaagccgaggagcagtagacaacagcacgtaccgtgtgtgcagcgtcctaccgtcctgcaccaggactggctgaatg
50 gcaaggagtacaagtgtcgtgtcctcaacaaagccctccagccccatcgagaaaacaatctccaaagccaaa

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Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCSVSNKALPAPIEKTISKAK

5

21. K322S CH2 WCH3

Nucleotide sequence:

cctgaactcctgggggaccgtcagtccttcttcccccaaaacccaaggacaccctcatgatctccggaccctgaggtcac
atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttcaactgtacgtggacggcgtggaggtgcataatgccaa
10 gacaaagccgcgggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatg
gcaaggagtacaagtgtcgtcgtcctcaacaaagccctccagccccatcgagaaaacaatctcaaaagccaagggcagccc
cgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaagg
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actccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtg
15 atgcatgaggtctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCSVSNKALPAPIEKTISKAKG
20 QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPPV
LDS DGSFFLYSKLTVDKSRWQQGNV FSCSV MHEALHNHYTQKSLSLSPGK

1. K322L CH2 WCH3

Nucleotide sequence:

tgatcaggagcccaaatctctgacaaaactcacacatccccaccgtcctcagcacctgaactcctggggggaccgtcagtccttct
cttcccccaaaacccaaggacaccctcatgatctccggaccctgaggtcacatgcgtggtggtggacgtgagccacgaaga
ccctgaggtcaagttcaactgttacgtggacggcgtggaggtgcataatgccaagacaaagccgcgggaggagcagtaaca
gcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggagtacaagtgcctggtctccaaca
agccctccagcctccatcgagaaaacaatctcaaaagccaaaggcagccccgagaaccacaggtgtacacctgccccat
30 cccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaaggcttctatccagcgacatcgccgtgagtggtg
agagcaatgggcagccggagaacaactacaagaccacgcctcccggtgactccgacggctccttctctctacagcaagct
caccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgaggtctgcacaaccactacacgca
gaagagcctctcctgtctccgggtaaatgatctaga

35 Amino acid sequence:

DQEPKSSDKTHTSPPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHED
PEVKFNWYVDGVEVHN AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCLV
SNKALPAPIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVE
WESNGQPENNYKTPPVLDSDGSFFLYSKLTVDKSRWQQGNV FSCSV MHEALHN
40 HYTQKSLSLSPGK

22. 2H7 scFv VHL11S hIgG1 (SSS-S)H K322SCH2 WCH3

Nucleotide sequence:

aagcttgccgcatgatttcaagtcagatttcaagtccttctgtaatacagtgcttcagtcataattgccagaggacaaattgttctt
45 cccagctctccagcaatcctgtctgcatctccaggggagaaaggtcacatgactgcagggccagctcaagtgttaattacatgcact
ggtaccagcagaagccaggatcctccccaaacctgatttatccccatccaacctggcttctggagtcctgtcgttcagtg
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ggagctctcaggttatctacagcagctggggctgagtcggtgaggcctggggcctcagtgaaagatgctcgaaggcttctggc
50 tacacatttaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
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cagcctgacatctgaagactctcggtctatttctgtgcaagagtgggtactatagtaactcttactggacttcgatgtctggggcac
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cctggggggaccgtcagttctctctcccccaaaacccaaggacaccctcatgatctcccgaccctgaggtcacatgcgtgg
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5 cgcgggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
tacaagtgtcggctccaacaagccctccagcccccacgagaaaacaatctccaaagccaaagggcagccccgagaacca
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ctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcagggggaacgtcttctcatgctccgtgatgcatgagg
10 cttgcacaaccactacacgcagaagagccctcctctgtccgggtaaatgatctaga

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
15 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCSVSNKALPAPIE
20 KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCSSVMHEALHNHYTQKSLSLS
PGK

23. 2H7 scFv VHL11S hIgG1 (SSS-S)H K322LCH2 WCH3

Nucleotide sequence:

aagcttgccgcatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagctccagcaaatctgtctgcatctccaggggagaaggtcacaatgactgcagggccagctcaagtgaattacatgcact
ggtagcagcagaagccaggtacctccccaaacctggattatgccccatccaacctggcttctggagtcctgctcgttcagtg
30 gcagtgggtctgggacctcttactcttcacaatcagcagagtggaggtggaagatgctgccacttattactgccagcagtgagttt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtgggtgagctggaggaggtg
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ggtagacttcttacaatcagaagtcaagggaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
35 cagcctgacatctgaagactctcggtctatttctgtgcaagagtgggtactatagtaactcttactggtagcttcgatgtctggggcac
agggaccacgggtaccgtctctctgatcaggagcccaaatctctgacaaaactcacatccccaccgtcctcagcacctgaact
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cgcggggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
40 tacaagtgcctggttccaacaagccctccagcccccacgagaaaacaatctccaaagccaaagggcagccccgagaacca
caggtgtacaccctgccccatcccggtatgagctgaccaagaaccagggtcagcctgacctgctggtcaaggcttctatcca
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ctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcagggggaacgtcttctcatgctccgtgatgcatgagg
ctctgcacaaccactacacgcagaagagccctcctctgtctccgggtaaatgatctaga
45

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
50 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK

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5

Nucleotide sequence:

10

15

20

25

20

35

40

Nucleotide sequence:

45

Amino acid sequence
PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPASIEKTISKAK

50

26. P331S CH2 WCH3

WO 2005/017148

PCT/US2003/041600

Nucleotide sequence:

cctgaactcctgggggaccgtcagttcttcttccccccaaacccaaggacaccctcatgatctcccgaccctgaggtcac
atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagtcaactggtacgtggacggcgtggaggtgcataatgcaa
gacaaagccgcgggaggagcagtacaacagcagctaccgtgtgtgcagcgtcctaccgtcctgcaccaggactggctgaatg
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cgagaaccacaggtgtacaccctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgacctggtcaaagg
cttctatcccagcgacatcgccgtggagtgaggagagcaatgggcagccggagaacaactacaagaccacgcctcccgctgtgg
actccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtg
atgcatgaggtctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

10

Amino acid sequence

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPASIEKTISKAKG
QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPPV
15 LDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

27. 2H7 scFv VH L11S (SSS-S)H P331S CH2 WCH3

Nucleotide sequence:

aagcttgcgcctatgatttcaagtgcagatttctcagcttctgctaatcagtgcttcagtcataattgccagaggacaaattgtctct
20 cccagctcctcagcaatcctgtctgcatctccaggggagaagggtcacaatgacttcagggccagctcaagtgttaattacatgcact
ggtaccagcagaagccaggtatcctcccccacccctggaattatgccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtggtgtctgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgagttt
taaccaccacagcttgggtgtctgggaccaagctggagctgaaagatggcgggtggtcgggcgggtggatctggaggaggtg
ggagctctcaggcttatctacagcagcttggggctgagtcgggtgaggcctggggcctcagtgaaagatgctcgaagcttctggc
25 tacacatttaccagttacaatatgactgggtaagcagacacctagacagggcctggaatggattggagctattatccaggaat
gggtgatacttctacaatcagaagttcaagggaagggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
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cgcgaggaggagcagtacaacagcacgtaccgtgtgtgcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
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35 ctcttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgagg
ctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

40

Amino acid sequence

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
40 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
45 DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPASIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPN
NYKTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLS
PGK

50

28. 2H7 scFv VH L11S (CSS-S)H P331S CH2 WCH3

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PCT/US2003/041600

Nucleotide sequence:

aagcttgccgcatggaatttcaagtcagattttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgtctct
cccagctctccagcaatctgtctgcatctccaggggagaaggtcacatgactgcagggccagctcaagtgtaagttacatgcact
ggtaccagcagaagccaggatcctccccaaacctggalltatgccccatccaacctggcttctggagtcctgctcgttcagtg
5 gcagtggtgctgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgagttt
taaccacccacgttcgggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtggtggatctggaggagtg
ggagctctcaggcttactacagcagctggggctgagtcggtgagggcctggggcctcagtgaaagatgctcgaaggcttctggc
tacacattaccagttacaatatgcactgggtaaagcagacacctagacaggcctggaatggattggagctatttatccaggaaat
ggtgatacttctacaatcagaagttcaaggccaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
10 cagcctgacatctgaagactctgcggtctatttctgtcgaagagtggtgactatagtaacttactggtacttgcagctctgggcac
agggaccacgggtcaccgtctctctgacagagcccaatctgtgacaaaactcacacatccccaccgtctcagcactgaact
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15 tacaagtgaaggtctccaacaagccctccagcctccatcgagaaaacaatctccaagccaaaggcgagccccgagaacca
caggtgtacacctgcccccatcccggtgagctgaccaagaaccaggtcagcctgacctgctgcaaggcttctatccca
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20

Amino acid sequence

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
25 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTTVTVSSDQEPKSCDK
THTSPSSAPELGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPASIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
30 NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFSQVMHEALHNHYTQKSLSLS
PGK

29. T256N CH2 region

Nucleotide sequence:

Cctgaactcctggggggaccgtcagttctctctcccccaaaacccaaggacacctcatgatctcccggaacctgaggtca
35 catgcgtggtggtgacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgcca
agacaaagccgcgggaggagcagtagaacagcaggtaccgtgtggtcagcgtcctaccgtcctgaccaggactggctgaat
ggcaaggagtacaagtgaaggtctccaacaagccctccagccccatcgagaaaacaatctccaagccaaa

Amino acid sequence

PELLGGPSVFLFPPKPKDTLMISRNPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK

30. T256N CH2 WCH3

Nucleotide sequence:

cctgaactcctggggggaccgtcagttctctctcccccaaaacccaaggacacctcatgatctcccggaacctgaggtcac
45 atgcgtggtggtgacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgcca
gacaaagccgcgggaggagcagtagaacagcaggtaccgtgtggtcagcgtcctaccgtcctgaccaggactggctgaatg
gcaaggagtacaagtgaaggtctccaacaagccctccagccccatcgagaaaacaatctccaagccaaaggcagccc
50 cgagaaccacaggtgtacacctgcccccatcccggtgagctgaccaagaaccaggtcagcctgacctgctgctcaagg
ctctatccacgcacatcgccgtggagtgaggagcaatggcgagccggagaaacaactacaagaccacgcctccctgctggtg

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actccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtg
atgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

Amino acid sequence

5 PELLGGPSVFLFPPKPKDTLMISRNPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTKISKAKG
QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPV
LDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

10 31. 2H7 scFv VH L11S (SSS-S)H T256N CH2 WCH3

Nucleotide sequence:

aagcttgcggccatgattttcaagtcagattttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
cccagcttcagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagttaagttacatgcact
15 ggtaccagcagaagccaggtatctccccaaacctggatttatccccatccaaacctggtcttggagtcctgtcgttcagtg
gcagtgggtctgggaccttactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgagggtt
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ggagctctcaggttatctacagcagctctgggctgagtcggtagggcctgggcctcagtgaaatgctcgaagcctctggc
tacacattaccagttacaatatgcactgggtaaacgagacacctagacagggcctggaatggattggagctatttatccaggaat
20 ggtgatacttctacaatcagaagtcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagtcag
cagcctgacatctgaagactctgcggcttattctgtgcaagagtgggtgactatagtaacttactgggtactcgtatctggggcac
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25 cgggggaggagcagtagaacagcacgtaccgtgtggtcagcgtcctaccgtcctgcaccaggactgggtgaatggcaaggag
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acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgcctgggtcaaggcttctatccc
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gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
30 gctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

Amino acid sequence

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
35 FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRNPEVTCVVVDVSHEDPEVKFNWY
VDGVEVHNNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
40 EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
NNYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSL
SPGK

45 32. 2H7 scFv VH L11S (CSS-S)H T256N CH2 WCH3

Nucleotide sequence:

aagcttgcggccatgattttcaagtcagattttcagcttctgctaatactgcttcagtcataattgccagaggacaaattgttctct
cccagcttcagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagttaagttacatgcact
50 ggtaccagcagaagccaggtatctccccaaacctggatttatccccatccaaacctggtcttggagtcctgtcgttcagtg
gcagtgggtctgggaccttactctctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgagggtt
taaccacccacgttcggtgctgggaccaagctggagctgaagatggcgggtggctcggcggtggtggtatctggaggaggtg

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ggagctctcaggcttatctacagcagctctggggctgagtcggtgaggcctggggcctcagtgagatgtcctgcaaggcttctggc
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ggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctcggtctatttctgtgcaagagtgggtgactatagtaactcttactggctacttcgatgtctggggcac
5 agggaccacgggtcaccgtctctctgatcaggagcccaaatctgtgacaaaactcacacatccccaccgtcctcagcacctgaact
cctgggggggaccgtcagctctctctcccccaaaaacccaaggacaccctcatgatctcccgaacccctgaggtcacatgcgtgg
tggtggacgtgagccacgaagaccctgaggtcaagttcaactgggtacgtggacggcgtggaggtgcataatgccaaagacaagc
cgcgaggagagcagtagacaacagcacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
tacaagtgcagggtctccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaaggcgagccccgagaacc
10 acaggtgtacaccctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgcctgggtcaaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgacg
gtcctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcagtag
gtctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

15 Amino acid sequence
MDFQVQIFSFLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
20 TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFYFDVWGTGTTVTVSSDQEPKSCDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRNPVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
NNYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFSFSVMHEALHNHYTQKSLSL
25 SPGK

33. RTPE/QNAK (255-258) CH2

Nucleotide sequence:

cctgaactcctggggggaccgtcagctcttctcttcccccaaaaacccaaggacaccctcatgatctcccagaacgtaaggtcac
30 atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttcaactgggtacgtggacggcgtggaggtgcataatgccaa
gacaaagccgcgggaggagcagtagacaacagcacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctgaatg
gcaaggagtacaagtcaaggtctccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaa

Amino acid sequence

35 PELLGGPSVFLFPPKPKDTLMISQNAKVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK

34. RTPE/QNAK (255-258)CH2 WCH3

Nucleotide sequence:

cctgaactcctggggggaccgtcagctcttctcttcccccaaaaacccaaggacaccctcatgatctcccagaacgtaaggtcac
40 atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttcaactgggtacgtggacggcgtggaggtgcataatgccaa
gacaaagccgcgggaggagcagtagacaacagcacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctgaatg
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cgagaaccacaggtgtacaccctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgcctggtcaaaagg
45 ctctatcccagcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctgg
actccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtg
atgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

Amino acid sequence

50 PELLGGPSVFLFPPKPKDTLMISQNAKVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKG

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QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTPPV
LDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

35. 2H7 scFv VH L11S (SSS-S)H RTPE/QNAK (255-258)CH2 WCH3

5

Nucleotide sequence:

aagcttccgccatggatttcaagtgcagatttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
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ggtagcagcagaagccagatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgttcagtg
10 gcagtggtctgggacctcttactctcacaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgaggtt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcgggcgggtggatctggaggagtg
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gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

25

Amino acid sequence

MDFVQVQIFSLLISASVIIARGQIVLSQSPAILASAPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
30 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISQNAKVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
35 NNYKTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSL
SPGK

36. 2H7 scFv VH L11S (CSS-S)H RTPE/QNAK (255-258)CH2 WCH3

Nucleotide sequence:

aagcttccgccatggatttcaagtgcagatttcagcttcctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagctccagcaatcctgtctgcatctccaggggagaaggtcacaatgactgcagggccagctcaagtgttaattacatgcact
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45 tacacattaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
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50 cctggggggaccgtcagcttctcttcccccaaaacccaaggacacctcatgatctccagaacgctaaggtcacatgcgtgg
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acaggtgtacacctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgcctggctaaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaaactacaagaccacgcctcccgtgctggactccgacg
5 gctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
10 QQKPGSSPKPWYIAPSNLASGVPARFSGSGSSTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSCDK
15 THTSPSSAPELLGGPSVFLFPPKPKDTLMISQNAKVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
NNYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSL
SPGK

20 36. K290Q CH2 region

Nucleotide sequence:

cctgaactcctgggggaccgtcagctcttcttcccccaaaacccaaggacaccctcatgatctcccgaccctgaggtcac
atgctgtgtgtggacgtgagccacgaagaccctgaggtcaagtcaactgtacgtggacggcgtggaggtgcataatgcaa
25 gacacagccgaggaggagcagtacaacagcacgtaccgtgtgtcagcgtctcaccgtcctgcaccaggactggctgaatg
gcaaggagtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaacaatctccaaagccaaa

Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTQPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK

30

37. K290Q CH2 WCH3

Nucleotide sequence:

Cctgaactcctgggggaccgtcagcttcttcccccaaaacccaaggacaccctcatgatctcccgaccctgaggtca
catgctgtgtgtggacgtgagccacgaagaccctgaggtcaagtcaactgtacgtggacggcgtggaggtgcataatgcca
35 agacacagccgaggaggagcagtacaacagcacgtaccgtgtgtcagcgtctcaccgtcctgcaccaggactggctgaat
ggcaaggagtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaacaatctccaaagccaaaggcagcc
ccgagaaccacaggtgtacacctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgcctgtgcaaaag
gcttctatcccgacatcgccgtggagtgggagagcaatgggcagccggagaaactacaagaccacgcctcccgtgctg
gactccgacggctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgt
40 gatgcatgaggctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
AKTQPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKG
45 QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPV
LDSGDSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

38. 2H7 scFv VH L11S (SSS-S)H K290Q CH2 WCH3

Nucleotide sequence:

aagcttgcggccatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
50 cccagctctccagcaatcctgtctgcacatccaggggagaaggtcacaatgacttcagggccagctcaagtgtaagttacatgcact

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ggtaccagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgcttcagt
gcagtgggtctgggaccttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtggagttt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcggaggctcggcggtggatctggaggaggtg
ggagctctcaggcttatctacagcagcttggggctgagtcggtgaggcctggggcctcagtgaagatgctcctgaaggcttctggc
5 tacacatttaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
ggtgatacttctacaatcagaagttcaagggaagggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtgactatagtaactcttactggacttcgatgctggggcac
agggaccacggtcaccgtcttctgacagggagcccaaatcttctgacaaaactcacacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttcttcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtgg
10 tggaggacgtgagccacgaagacctgaggtcaagttcaactggtagcgtggacggcgtggaggtgcataatgccaagacacagc
cgcgggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtctgcaccaggactggctgaatggcaaggag
tacaagtgaaggtccaacaagccctccagccccatcgagaaaacaatctccaaagccaaaggcagccccgagaacc
acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgcctggtaaaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccagcctcccgctggtgactccgacg
15 gctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctcgggtaaatgatctaga

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
20 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFVDVWGTGTTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
25 DGVEVHNAKTQPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
PGK

30 39. 2H7 scfv VH L11S (CSS-S)H K290Q CH2 WCH3

Nucleotide sequence:

aagcttgcgccatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaaattgttctct
cccagctccagcaatcctgtctgcatctccaggggagaaggtcacaatgacttcagggccagctcaagtgaattacatgcact
ggtagcagaagccaggatcctccccaaacctggatttatgccccatccaacctggcttctggagtcctgctcgcttcagt
35 gcagtgggtctgggaccttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtggagttt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcggaggctcggcggtggatctggaggaggtg
ggagctctcaggcttatctacagcagcttggggctgagtcggtgaggcctggggcctcagtgaagatgctcctgaaggcttctggc
tacacatttaccagttacaatatgcactgggtaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
ggtgatacttctacaatcagaagttcaagggaagggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
40 cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtgactatagtaactcttactggacttcgatgctggggcac
agggaccacggtcaccgtcttctgacagggagcccaaatcttctgacaaaactcacacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttcttcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtgg
tggaggacgtgagccacgaagacctgaggtcaagttcaactggtagcgtggacggcgtggaggtgcataatgccaagacacagc
cgcgggaggagcagtacaacagcacgtaccgtgtggtcagcgtcctcaccgtctgcaccaggactggctgaatggcaaggag
45 tacaagtgaaggtccaacaagccctccagccccatcgagaaaacaatctccaaagccaaaggcagccccgagaacc
acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgcctggtaaaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccagcctcccgctggtgactccgacg
gctccttcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctcgggtaaatgatctaga

Amino acid sequence:

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PCT/US2003/041600

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
 FNPPTFGAGTKLELKDGGGSGGGGSGGGSSQAYLQQSGAESVRPGASVKMSCK
 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
 5 TAYMQLSSLTSEDSAVYFCARVVYYSNSYWFVDVWGTGTTVTVSSDQEPKSCDK
 THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
 DGVEVHNAKTQPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
 KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
 NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFCSSVMHEALHNHYTQKSLSLS
 10 PGK

40. A339PCH2

Nucleotide sequence:

cctgaactcctgggggaccgtcagttctctctccccccaaaacccaaggacaccctcatgatctcccgaccctgaggtcac
 15 atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttaactggtacgtggacggcgtggaggtgcataatgcaa
 gacaagccgcgggaggagcagtagacaacagcacgtaccgtgtggtcagcgtctcaccgtctgaccaggactggctgaatg
 gcaaggagtacaagtgcagggtctccaacaaagccctcccagccccatcgagaaaacaatctcaaacccaaa

Amino acid sequence:

20 PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
 AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKPK

41. A339P-CH2 WCH3

25 Nucleotide sequence:

cctgaactcctgggggaccgtcagttctctctccccccaaaacccaaggacaccctcatgatctcccgaccctgaggtcac
 atgcgtggtggtggacgtgagccacgaagaccctgaggtcaagttaactggtacgtggacggcgtggaggtgcataatgcaa
 gacaagccgcgggaggagcagtagacaacagcacgtaccgtgtggtcagcgtctcaccgtctgaccaggactggctgaatg
 gcaaggagtacaagtgcagggtctccaacaaagccctcccagccccatcgagaaaacaatctcaaacccaaaaggcagccc
 30 cgagaaccacaggtgtacaccctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaagg
 ctctatccagcgacatcgccgtggagtgaggagagcaatgggcagccggagaaactacaagaccacgcctcccgctgctgg
 actccgacggctctctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctccgtg
 atgcatgaggtctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

35 Amino acid sequence:

PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHN
 AKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKPKG
 QPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPV
 40 LDSGDSFFLYSKLTVDKSRWQQGNVFCSSVMHEALHNHYTQKSLSLSPGK

42. 2H7 scFv VHL11S (SSS-S)H A339P CH2 WCH3

Nucleotide sequence:

aagcttgccgccatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
 cccagctctccagcaatctgtctgcatctccaggggagaaggtcaccaatgacttcagggccagctcaagtgttaagtacatgcact
 45 ggtaccagcagaagccaggatctctccccaaaacccctggatttatccccatccaacctggctctggagtcctgtcgtctcagtg
 gcagtggtgtctgggacctcttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgaggtt
 taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcgggtggctcggcggtgtggtatctggaggaggtg
 ggagctctcaggttatctacagcagctctggggtgagtcggtgaggcctggggcctcagtgaaatgtcctgcaaggcttctggc
 tacacattaccagttacaatatgcactgggtaaagcagacacctagacagggcctggaatggattggagctatttatccaggaaat
 50 ggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
 cagcctgacatctgaagactctcggtctatttctgtgcaagagtggtgtactatagtaactcttactggtacttcgatgtctggggcac

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agggaccacgggtcaccgtctctctgatcaggagcccaaatctcttgacaaaactcacacatccccaccgtcctcagcacctgaact
cctgggggggaccgtcagttctctctctcccccaaaacccaaggacaccctcatgatctccggaccctgagggtcacatgcgtgg
tggtggacgtgagccacgaagaccctgaggtcaagtcaactggtagtggtggcgtggaggtgcataatgccaagacaaagc
cgcgaggagcagtagacaacagcacgtaccgtgtggtcagcgtcctcaccgtctgcaccaggactgggtgaatggcaaggag
5 tacaagtgcagggtctcaacaaagccctcccagccccatcgagaaaacaatctccaaacccaagggcagccccgagaacc
acaggtgtacaccctgccccatcccgggatgagctgaccaagaaccagggtcagcctgacctgcctgggtcaaaggcttctatccc
agcgacatcgccgtggagtgaggagagcaatgggcagccggagaaactacaagaccacgcctcccgtgctggactccgacg
gtctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcagtag
gtctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

10

Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
15 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKPKGQPPEPVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
20 NYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVDFSCSVMHEALHNHYTQKSLSLS
PGK

43. 2H7 scFv VHL11S (CSS-S)H A339P CH2 WCH3

25 Nucleotide sequence:

aagcttgccgccattgatttcaagtcagatttccagcttctgctaatcagtgcttcagtcataattgccagaggacaaattgtctct
cccagctctccagcaatcctgtctgcatctccaggggagaaggtcacatgacttcagggccagctcaagtgaattacatgcact
ggtagcagcagaagccaggtatctccccaaacctggatttatccccatcaacctggcttctggagtcctgtcgtctcagtg
gcagtgggtctgggaacctctactctctcaaatcagcagagtgaggctgaagatgctgccacttattactgccagcagtgagttt
30 taaccacccacgttcgggtgctgggaccaagctggagctgaaagatggcgggtgctcggcggtgggtgagctggaggaggtg
ggagctctcaggttatctacagcagctggggctgagtcggtaggcctggggcctcagtgaaagatgctcctgcaagctctggc
tacacattaccagttacaatatgactgggtaaagcagacacccagacagggcctggaatggattggagctattatccagggaat
ggtagacttctacaatcagaagtcaagggaagggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtactatagtaactcttactggtacttcgatgtctggggcac
35 agggaccacgggtcaccgtctctctgatcaggagcccaaatctgtgacaaaactcacacatccccaccgtcctcagcacctgaact
cctgggggggaccgtcagttctctctctcccccaaaacccaaggacaccctcatgatctccggaccctgagggtcacatgcgtgg
tggtggacgtgagccacgaagaccctgaggtcaagtcaactggtagtggtggcgtggaggtgcataatgccaagacaaagc
cgcgaggagcagtagacaacagcacgtaccgtgtggtcagcgtcctcaccgtcctgcaccaggactgggtgaatggcaaggag
tacaagtgcagggtctcaacaaagccctcccagccccatcgagaaaacaatctccaaacccaagggcagccccgagaacc
40 acaggtgtacaccctgccccatcccgggatgagctgaccaagaaccagggtcagcctgacctgcctgggtcaaaggcttctatccc
agcgacatcgccgtggagtgaggagagcaatgggcagccggagaaactacaagaccacgcctcccgtgctggactccgacg
gtctcttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcagtag
gtctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

45 Amino acid sequence:

MDFQVQIFSFLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPGNGDTSYNQKFKGKATLTVDKSSS
50 TAYMQLSSLTSEDSAVYFCARVVYYNSNSYWFYFDVWGTGTTVTVSSDQEPKSCDK
THTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV

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DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKPKGQPREEQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVSCSVMHEALHNHYTQKSLSLS
PGK

5

44. G28-1VH

Nucleotide sequence:

gcgggtccagctgcagcagctggacctgagctgaaaagcctggcgcttcagtgagatttctgcaaggcttctggttactcattc
10 actggctacaatatgaactgggtgaagcagaataatgaaagagcctgagtgattggaaatattgatccttattatggtggtacta
cctacaaccggaagtcaagggaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctctgac
atctgaggactctgcagctctattactgtgcaagatcggtcgccctatggactactgggggtcaaggaaacctcagtcaccgtctcttc
gatcag

15 Amino acid sequence:

AVQLQQSGPELEKPGASVKISCKASGYSFTGYNMNWVKQNNGKSLEWIGNIDPY
YGGTTYNRKFKGKATLTVDKSSSTAYMQLKSLTSEDSAVYYCARSVGPMDYWG
QGTSVTVSSDQ

20 45. G28-1VL

Nucleotide sequence:

aagcttgcggccatggtatccacagctcagttccttgggtgctgctgctgtggcttacaggtggcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatatgttacagttatttggcttgg
atcagcagaaacagggaatatctcctcagctcctgggtctcttttgcacaaaccttagcagaaggtgtgccatcaagggtcagtgga
25 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
ccgtggacgttcgggtggaggcaccgaactggagatcaaaaggtggcgggtggctcgggcgggtgggtgggtcgggtggcggcgat
cgta

Amino acid sequence:

30 MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLA
YQQKQKGKSPQLLVSFATLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHHS
DNPWTFGGGTELEIKGGGSGGGGSGGGGSS

35 46. G28-1 scFv

Nucleotide sequence:

aagcttgcggccatggtatccacagctcagttccttgggtgctgctgctgtggcttacaggtggcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatatgttacagttatttggcttgg
atcagcagaaacagggaatatctcctcagctcctgggtctcttttgcacaaaccttagcagaaggtgtgccatcaagggtcagtgga
40 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
ccgtggacgttcgggtggaggcaccgaactggagatcaaaaggtggcgggtggctcgggcgggtgggtgggtcgggtggcggcgat
cgtcagcgggtccagctgcagcagctgtgacctgagctgaaaagcctggcgcttcagtgagatttctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatgaaagagccttgagtgattggaaatattgatccttattatggtggt
actacctacaaccggaagtcaagggaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
45 gacatctgaggactctgcagctctattactgtgcaagatcggtcgccctatggactactgggggtcaaggaaacctcagtcaccgtctc
ttctgatcag

Amino acid sequence:

50 MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLA
YQQKQKGKSPQLLVSFATLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHHS
DNPWTFGGGTELEIKGGGSGGGGSGGGGSSAVQLQQSGPELEKPGASVKISCKA

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SGYSFTGYNMNWWVKQNNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
AYMQLKSLTSEDSAVYYCARSVGPMDYWGQTSVTVSSDQ

5 **47. G28-1 VHL11S**

Nucleotide sequence:

gcgggtccagctgcagcagctcggacctgagtcggaaaagcctggcgcttcagtgaaagattcctgcaaggcttctggttactcattc
actggtcacaatatgaactgggtgaagcagaataatggaaagagccttgagtgattggaaatattgatccttattatggtggtacta
cctacaaccggaagttcaaggggcaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctgac
10 atctgaggactctgcagctctattactgtgcaagatcggtcggccctatggactactggggtaaggaacctcagtcaccgtctctct
gatcag

Amino acid sequence:

15 AVQLQQSGPESEKPGASVKISCKASGYSTGYNMNWWVKQNNGKSLEWIGNIDPYY
GGTTYNRKFKGKATLTVDKSSSTAYMQLKSLTSEDSAVYYCARSVGPMDYWGQ
GTSVTVSSDQ

20 **48. G28-1 VHL11S scFv**

Nucleotide sequence:

aagcttgcgcgatggtatccacagctcagttccttgggttgctgctgctgtggcttacagtggtgcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatatgtttacagttatttggcttgg
atcagcagaacagggaaaatctctcagctcctggtctcttttgcacaaaccttagcagaaggtgtccatcaagggtcagtgga
25 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagttatttctgcaacatcattccgataat
ccgtggacgttcgggtggagaccgaactggagatcaaaaggtggcgggtgctcggcggtgggtgggtcgggtggcggcggt
cgtcagcgggtccagctgcagcagcttgacctgagtcgaaaagcctggcgcttcagtgaaagattcctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatggaaagagccttgagtgattggaaatattgatccttattatggtggt
actacctacaaccggaagttcaagggaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
30 gacatctgaggactctgcagctctattactgtgcaagatcggtcggccctatggactactggggtaaggaacctcagtcaccgtctc
ttctgatcag

Amino acid sequence:

35 MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLA
YQKQKGKSPQLLVSFATLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHH
DNPWTFGGGTELEIKGGGGSGGGSGGGSSAVQLQQSGPESEKPGASVKISCKA
SGYSFTGYNMNWWVKQNNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
AYMQLKSLTSEDSAVYYCARSVGPMDYWGQTSVTVSSDQ

40 **49. G28-1 scFv (SSS-S)H WCH2 WCH3**

Nucleotide sequence:

aagcttgcgcgatggtatccacagctcagttccttgggttgctgctgctgtggcttacagtggtgcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatatgtttacagttatttggcttgg
atcagcagaacagggaaaatctctcagctcctggtctcttttgcacaaaccttagcagaaggtgtccatcaagggtcagtgga
45 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagttatttctgcaacatcattccgataat
ccgtggacgttcgggtggagaccgaactggagatcaaaaggtggcgggtgctcggcggtgggtgggtcgggtggcggcggt
cgtcagcgggtccagctgcagcagcttgacctgagtcgaaaagcctggcgcttcagtgaaagattcctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatggaaagagccttgagtgattggaaatattgatccttattatggtggt
actacctacaaccggaagttcaagggaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
50 gacatctgaggactctgcagctctattactgtgcaagatcggtcggccctatggactactggggtaaggaacctcagtcaccgtctc
ttctgatcatgatcaggagcccaaatcttctgacaaaactcacacatcccaccgtcctcagcacctgaactcctgggggggaccgtc

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agtcttctcttcccccaaaacccaaggacacctcatgatctcccgaccctgaggtcacatgcgtggtggtggacgtgagcc
 acgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatccaagacaaagccgaggaggagca
 gtacaacagcacgtaccgtgtggtcagcgtctcaccgtctgcaccaggactggctgaatggcaaggagtacaagtgaagggtc
 tccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaaccacaggtgtacacct
 5 gccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaggcttctatcccagcgacatcgccgtg
 gagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgacggctccttctctctac
 agcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgaggctctgcacaaccact
 acacgcagaagagcctctcctgtctccgggtaaatgatctaga

10 Amino acid sequence:

MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLAW
 YQQKQKGKSPQLLVSF AKTLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHHS
 DNPWTFGGGTELEIKGGGSGGGGSGGGSSAVQLQQSGPELEKPGASVKISCKA
 SGYSFTGYNMNWKQNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
 15 AYMQLKSLTSEDSAVYYCARSVGPMDYWGQTSVTVSSDHDQEPKSSDKTHTSP
 PSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVE
 VHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISK
 AKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKT
 TPPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

20

50. G28-1 scFv IgAW H IgG1WCH2 WCH3

Nucleotide sequence:

aagettccgccatglatccacagctcagttccttgggtgctgctgctgctggttacaggtggcagatgtgacatccagatgactc
 agtctccagctccctatctgcatctgtggagagactgtcaccatcacatgtcgaacaagtgaatatgtttagatttggcttggt
 25 atcagcagaacagggaaaatctcctcagctcctggtctcttttgcacaaacctagcagaagggtgtccatcaagggtcagtgga
 gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgcaacatcattccgataat
 ccgtggacgttcggtggagccaccgaactggagatcaaaagtgccgggtggtcggcggtggtgggtggcgccggat
 cgtcagcggtccagctgcagcagctgtgacctgagctggaaaagcctggcgcttcagtgagatttctgcaaggcttctgttact
 cattcactggctacaatatgaactgggtgaagcagaataatgaaagagccttgagtggaattggaatatgatccttattatggtggt
 30 actacctacaaccggaagtcaagggaaggccacattgactgtagacaaatctccagcacagcctacatgcagctcaagagctc
 gacatctgaggactctgcagcttattactgtgaagatcggtcggccctatggactactggggtcaaggaaacctcagtcaccgtctc
 ttctgatcagccagttccctcaactccacctacccatctccctcaactccacctacccatctccctcatcgccacctgaactcctgg
 gggacccgtcagttctcttcccccaaaacccaaggacacctcatgatctcccgaccctgaggtcacatgcgtggtggtg
 gacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatccaagacaaagccgag
 35 ggaggagcagtcacaacagcacgtaccgtgtggtcagcgtctcaccgtctgcaccaggactggctgaatggcaaggagtacaa
 gtgcaaggctccaacaaagccctcccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaaccacagg
 tgfacacctgccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaggcttctatcccagcga
 catcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgcctcccgtgctggactccgacggctcct
 tcttctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgaggctctg
 40 cacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLAW
 YQQKQKGKSPQLLVSF AKTLAEGVPSRFSGSGSGTQFSLKISSLPEDSGSYFCQHHS
 45 DNPWTFGGGTELEIKGGGSGGGGSGGGSSAVQLQQSGPELEKPGASVKISCKA
 SGYSFTGYNMNWKQNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
 AYMQLKSLTSEDSAVYYCARSVGPMDYWGQTSVTVSSDQVPSTPPTPSPSTPPT
 PSPSCAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDG
 VEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTI
 50 SKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNY

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KTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPG
K

51. G28-1 scFv VHL11S (SSS-S)H WCH2 WCH3

5 Nucleotide sequence:

aagcttgccgcatggtatccacagctcagttccttgggtgctgctgctggttacaggtggcagatgtgacatccagatgactc
agtcctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaataatgttacagtatttggcttgg
atcagcagaaacagggaaaatctctcagctcctggctcttttgcacaaaccttagcagaaggtgtccatcaagggtcagtgga
gtggatcaggcacacagttttctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
10 ccgtggacgttcggtggagggcaccgaactggagatcaaaaggtggcgggtggctcggcggtggtgggtgggtggcgcggtg
cgtcagcgggtccagctgcagcagctgtgacctgagtcggaaaagcctggcgcttcagtgaaatttctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatggaaagaccttgagtgattggaaatattgatccttattatgggtg
actacctacaaccggaagtcaagggaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
gacatctgaggactctgcagcttattactgtgaagatcggtcggccctatggactactgggtgcaaggaaacctcagtcaccgtctc
15 ttctgatcaggagcccaaatcttctgacaaaactcacatccccaccgtcctcagcacctgaactcctggggggaccgtcagctct
cctcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtggtggtggacgtgagccacgaa
gacctgaggtcaagttcaactggtacgtggacggcggtggaggtgcataatgccaagacaaagccggggaggagcagtagaa
cagcacgtaccgtgtggtcagcgtcctaccgtcctgcaccaggactggctgaatggcaaggagtacaagtgcagggtctccaac
aaagccctcccagccccatcgagaaaacaatctcacaagccaaagggcagccccgagaaccacaggtgtacacctgcccc
20 atccgggatgagctgaccaagaaccaggtcagcctgacctggtcgaaggcttctatcccagcgacatcgccgtggagtg
gagagcaatgggcagccggagaacaactacaagaccacgctcctcgtggtgactccgacggctccttctctctacagcaag
ctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgcatgaggctctgcacaaccactacacgc
agaagagcctctcctgtctccggtaaatgatctaga

25 Amino acid sequence:

MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTTTCRTSENVYSYLA
YQQKQKGKSPQLLVSFATLAEGVPSRFSGSGSGTQFSLKISSLQPEDSGSYFCQHH
DNPWTFGGGTELEIKGGGSGGGGSGGGGSSAVQLQSGPSEKPGASVKISCKA
SGYSFTGYNMNWKQNNNGKSLEWIGNIDPYYGGTTYNRKFKGKATLTVDKSSST
30 AYMQLKSLTSEDSAVYYCARSVGPMDYWGQGTSTVTVSSDHDQEPKSSDKTHTSP
PSSAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVE
VHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISK
AKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKT
TPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK
35

52. G28-1 scFv VHL11S (CSS-S)H WCH2 WCH3

Nucleotide sequence:

aagcttgccgcatggtatccacagctcagttccttgggtgctgctgctggttacaggtggcagatgtgacatccagatgactc
agtcctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaataatgttacagtatttggcttgg
40 atcagcagaaacagggaaaatctctcagctcctggctcttttgcacaaaccttagcagaaggtgtccatcaagggtcagtgga
gtggatcaggcacacagttttctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
ccgtggacgttcggtggagggcaccgaactggagatcaaaaggtggcgggtggctcggcggtggtgggtgggtggcgcggtg
cgtcagcgggtccagctgcagcagctgtgacctgagtcggaaaagcctggcgcttcagtgaaatttctgcaaggcttctggttact
cattcactggctacaatatgaactgggtgaagcagaataatggaaagaccttgagtgattggaaatattgatccttattatgggtg
45 actacctacaaccggaagtcaagggaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagctc
gacatctgaggactctgcagcttattactgtgaagatcggtcggccctatggactactgggtgcaaggaaacctcagtcaccgtctc
ttctgatcaggagcccaaatcttctgacaaaactcacatccccaccgtcctcagcacctgaactcctggggggaccgtcagctct
cctcttcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtggtggtggacgtgagccacgaa
gacctgaggtcaagttcaactggtacgtggacggcggtggaggtgcataatgccaagacaaagccggggaggagcagtagaa
50 cagcacgtaccgtgtggtcagcgtcctaccgtcctgcaccaggactggctgaatggcaaggagtacaagtgcagggtctccaac
aaagccctcccagccccatcgagaaaacaatctcacaagccaaagggcagccccgagaaccacaggtgtacacctgcccc

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5

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aagcttgccgcatggtatccacagctcagttccttgggtgctgctgctgtggcttacaggtggcagatgtgacatccagatgactc
agtctccagcctccctatctgcatctgtgggagagactgtcaccatcacatgtcgaacaagtgaatgtttacagttatttgcttggt
atcagcagaacagggaatctcctcagctcctggtctcttttgcacaaaccttagcagaagggtgcatcaagggtcagtgga
gtggatcaggcacacagtttctctgaagatcagcagcctgcagcctgaagattctggaagtatttctgtcaacatcattccgataat
5 ccgtggacgttcggtggaggcaccgaactggagatcaaaagggtggcgggtggctcgggcgggtggtgggtcgggtggcggcgat
cgtcagcgggtccagctgcagcagctcggacctgagtcggaaggcctggcgctcagtgaaagtctcagaggtctctggttact
cattcactggctacaataatgaactgggtgaagcagaataatggaagagccttgagtggaattggaatattgatccttattatggtgt
actacctacaaccggaagtcaagggaaggccacattgactgtagacaaatcctccagcacagcctacatgcagctcaagagct
gacatctgaggactctgcagctctattactgtcaagatcggctggccctatggactactgggtcaaggaaacctcagtcaccgtctc
10 tctgatcaggagcccaatctctgacaaaactcacacatccccaccgtgcccagcacctgaactcctggggggaccgtcagctct
cctctccccccaaaacccaaggacacctcatgatctcccggaccttgaggtcacatgcgtggtggtggacgtgagccacgaa
gacctgaggtcaagtcaactggtacgtggacggcgtggaggtgcataatgcaagacaaggcggggaggagcagtaaa
cagcacgtaccgtgtgtcagcgtcctcaccgtctgcaccaggactggctgaatggcaaggagtacaagtgaagggtctccaac
aaagccctcccagccccatcgagaaaacaatctcaaaagccaaagggcagccccgagaaccacaggtgtacacctgcccc
15 atccgggatgagctgaccaagaaccagggtcagcctgacctgctgctaaaggctctatccagcgacatcgccgtggagtgg
gagagcaatgggcagccggagaaacaactacaagaccacgctcctcctgctggactccgacggctccttctctctacagcaag
ctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctccgtgatgcatgaggtctctgcacaaccactacacgc
agaagagcctctcctgtctccggtaaatgatctaga

20 Amino acid sequence:

MVSTAQFLGLLLLWLTGGRCDIQMTQSPASLSASVGETVTITCRTSENVYSYLA
YQQKQKSPQLLVSF AKTLAEGVPSRFSGSGSGTQFSLKISSLQPEDSGSYFCQHHS
DNPWTFGGGTELEIKGGGSGGGGSGGGGSSAVQLQQSGPESEKPGASVKISCKA
SGYSFTGYNMNWKQNNKSLWIGNIDPYGGTTYNRKFKGKATLTVDKSSST
25 AYMQLKSLTSEDSAVYYCARSVGPMDYWQGTSVTVSSDQEPKSSDKTHTSPPCP
APELLGGPSVFLFPPKPKDTLMISRTPEVTCVVDVSHEDPEVKFNWYVDGVEVH
NAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK
GQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPP
VLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK
30

II. 54. HCTLA4 HIGG1 (SSS-S)H P238SCH2 WCH3

Nucleotide sequence:

atggcttccttgatttcagcggcacaaggctcagctgaacctggctgccaggacctggcctgcactctcctgtttttctctctc
atcctgtctcttgcaaaagcaatgcacgtggccagcctgctgtggtactggccagcagccgaggtatcgccagcttctgtgtga
35 gtatgcacatccaggcaaaagccactgaggtccgggtgacagtgttcggcaggtgacagccaggtgactgaagtctgtcgggc
aacctacatgacgggaatgagtgacctcttagatgattccatctgcacgggcacctccagtgaatacaagtgaacctcactat
ccaaggactgagggccatggacacgggactctacatctgcaagggtggagctcatgtaccaccgccatactacctgggcatagg
caacggaaccagatttatgtaattgatccagaacctgcccagattctgatcaacccaaatctctgacaaaactcacacatcccca
cgtcctcagcactgaactcctggggggatcgtcagttctcttccccccaaaacccaaggacacctcatgatctccggac
40 cctgaggtcacatgcgtggtggtggacgtgagccacgaagacctgaggtcaagtcaactggtacgtggacggcgtggaggt
gcataatgcaagacaagccgcgggaggagcagtaaacagcacgtaccgtgtgtcagcgtcctcaccgtctgcaccagg
actggctgaatggcaaggagtacaagtcaaggtctccaacaaagccctcccagccccatcgagaaaacaatctccaaagcca
aagggcagccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgc
ctgtcaaaaggctctatccagcgacatcgccgtggagtgaggagcaatgggcagccggagaaacaactacaagaccacgcc
45 tccgtgctgactccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctct
catgctccgtgatgcatgaggtctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatga

Amino acid sequence:

MACLGFRHKAQLNLAARTWPCTLLFFLLFIPVFCKAMHVAQPAVVLAASSRGIA
50 FVCEYASPGKATEVRVTVLRQADSQVTEVCAATYMTGNELTFLDDSICTGTSSGN

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QVNLTIQGLRAMDTGLYICKVELMYPPPYLIGINGTQIYVIDPEPCPDSDQPKSSD
KTHTSPPSSAPELLGGSSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWY
VDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPI
EKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPE
5 NNYKTTTPVLDSGDSFFLYSKLTVDKSRWQQGNVFSQVMHEALHNHYTQKSLSL
SPGK

55. FC2-2 VL

Nucleotide sequence:

10 gttgtaagcttgcgccatggattcacaggccaggttctatgttactgctgctatgggtatctggtacctgtggggacattgtgatg
tcacagtctccatcctcctagctgtgtcagttggagagaaggtttctatgagctgcaagtccagtcagagccctttatataatcacaat
caaaagaactacttggcctgttaccagcagataaccaggcagctctcctaaactgctgatttactgggcacccactaggggaatctgg
ggtccctgatcgttcacaggcagtggtatctgggacagatttactctcaccatcagcagagtgaaggctgaagacctggcagttta
15 ttactgtcagcaatattatactatctccacgttcggaggtggcaccagctggaaataaaagggtggcgggtggtcgggcgggtg
gtgggtcgggtggcggcgggagctcg

Amino acid sequence:

MDSQAQVLMMLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
QKNYLAWYQQIPGQSPKLLIYWASTRESGVPDRFTGSGSGTDFTLTISR VKAEDLA
20 VYYCQQYYTYPTFGGGTKLEIKGGGSGGGGSGGGGSS

56. FC2-2VH

Nucleotide sequence:

Gggagctcgcaggtgcagttgaaggagtcaggacctggcctggcggccctcacagagcctgtccatcacatgcaccgtctca
25 ggggtctcattaacctgtctatgggttaactgggttcgccagcctccaggaaagggtctggactggcgggaatgatatggggatg
ggaagcacagactataattcagctctcaatccagactgagcatcagtaaggacaactccaagagccaagtttcttaaaatggac
agtctacaaactgatgacacagccaggtactactgtgccagagatcactatggtaccactatgctatggactactggggcaagga
acctcagtcaccgtctcctctgatcag

30 Amino acid sequence:

GSSQVQLKESGPGLVAPSQSL SITCTVSGFSLTVYGVNWVRQPPGKGLDWLGMIW
GDGSTDYNSALKSRLSISKDNSKSQVFLKMDSLQTD TARYYCARDHYGTHYAM
DYWGQGTSTVTVSSDQ

35 57. FC2-2scFv

Nucleotide sequence:

gttgtaagcttgcgccatggattcacaggccaggttctatgttactgctgctatgggtatctggtacctgtggggacattgtgatg
tcacagtctccatcctcctagctgtgtcagttggagagaaggtttctatgagctgcaagtccagtcagagccctttatataatcacaat
caaaagaactacttggcctgttaccagcagataaccaggcagctctcctaaactgctgatttactgggcacccactaggggaatctgg
40 ggtccctgatcgttcacaggcagtggtatctgggacagatttactctcaccatcagcagagtgaaggctgaagacctggcagttta
ttactgtcagcaatattatactatctcccacgttcggagggtggcaccagctggaaataaaagggtggcgggtggtcgggcgggtg
gtgggtcgggtggcggcgggagctctcaggtgcagttgaaggagtcaggacctggcctgtgtgcgcctcacagagcctgtcc
atcacatgcaccgtctcagggttctcattaacctgtatggtgttaactgggttcgccagcctccaggaaagggtctggactggctgg
gaatgatatggggtgatggaagcacagactataattcagctctcaatccagactgagcatcagtaaggacaactccaagaccaa
45 gttttcttaaaatggacagctctacaaactgatgacacagccaggtactactgtgccagagatcactatggtaccactatgctatgg
actactggggtaaggaacctcagtcaccgtctcctctgatcag

Amino acid sequence:

MDSQAQVLMMLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
50 QKNYLAWYQQIPGQSPKLLIYWASTRESGVPDRFTGSGSGTDFTLTISR VKAEDLA
VYYCQQYYTYPTFGGGTKLEIKGGGSGGGGSGGGGSSQVQLKESGPGLVAPSQ

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SLSITCTVSGFSLTVYGVNWVRQPPGKGLDWLGMWGDGSTDYNSALKSRLSISK
DNSKSQVFLKMDSLQTTDDTARYYCARDHYGTHYAMDYWGQGTSVTVSSDQ

58. FC2-2 VHL11S

5 Nucleotide sequence:
gggagctctcaggtgcagttgaaggagtcaggacctggctcggcggccctcacagagcctgtccatcacatgcaccgtctcag
gggtctcattaaccgtctatgggttaactgggtcggcagcctccaggaaagggtctggactggggaatgatatggggtgatg
gaagcacagactataaattcagctctcaaatccagactgagcatcagtaaggacaactccaagagccaagtttctaaaaatggaca
gtctacaaactgatgacacagccaggtactactgtgccagagatcactatggtaccactatgctatggactactggggtcaaggaa
10 cctcagtcaccgtctcctctgatcag

Amino acid sequence:
(GSS)QVQLKESGPGSVAPSQSLSITCTVSGFSLTVYGVNWVRQPPGKGLDWLGM
WGDGSTDYNSALKSRLSISKDNSKSQVFLKMDSLQTTDDTARYYCARDHYGTHYA
15 MDYWGQGTSVTVSSDQ

59. FC2-2 VH L11S scFv

Nucleotide sequence:
gttgtaagcttgcggccatggattcacaggcccaggttctatgttactgctgctatgggtatctggtacctgtggggacattgtgatg
20 tcacagctctccatcctcctagctgtgtcagttggagagaagggttctatgagctgcaagtcagtcagagcctttatataatcacaat
caaaagaactacttggcctgtgaccagcagataccagggcagctctcctaaactgctgatttactgggcatccactagggaatctgg
ggtcctgatcgttcacaggcagtgatctgggacagatttactctcaccatcagcagagtgaaggctgaagacctggcagttta
ttactgtcagcaatattatcctatcctcccagctcggaggtggcaccagctggaaataaaagggtggcggtggtcggcggtg
25 gtgggtcgggtggcggggagctctcaggtgcagttgaaggagtcaggacctggctcggcggccctcacagagcctgtcc
atcacatgcaccgtctcagggttctcattaaccgtctatgggttaactgggtcggcagcctccaggaaagggtctggactggctgg
gaatgatatggggtgatggaagcacagactataaattcagctctcaaatccagactgagcatcagtaaggacaactccaagagccaa
gttttctaaaaatggacagctctacaaactgatgacacagccaggtactactgtgccagagatcactatggtaccactatgctatgg
actactgggggtcaaggaaacctcagtcaccgtctcctctgatcag

30 Amino acid sequence:
MDSQAQVLMMLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
QKNYLAWYQQIPGQSPKLLIYWASTRESGVPDRFTGSGSGTDFTLTISR VKAEDLA
VYYCQQYYTYPPTFGGGTKLEIKGGGGSGGGGSGGGGSSQVQLKESGPGSVAPSQ
SLSITCTVSGFSLTVYGVNWVRQPPGKGLDWLGMWGDGSTDYNSALKSRLSISK
35 DNSKSQVFLKMDSLQTTDDTARYYCARDHYGTHYAMDYWGQGTSVTVSSDQ

60. FC2-2 (SSS-S)H WCH2 WCH3

Nucleotide sequence:
gttgtaagcttgcggccatggattcacaggcccaggttctatgttactgctgctatgggtatctggtacctgtggggacattgtgatg
40 tcacagctctccatcctcctagctgtgtcagttggagagaagggttctatgagctgcaagtcagtcagagcctttatataatcacaat
caaaagaactacttggcctgtgaccagcagataccagggcagctctcctaaactgctgatttactgggcatccactagggaatctgg
ggtcctgatcgttcacaggcagtgatctgggacagatttactctcaccatcagcagagtgaaggctgaagacctggcagttta
ttactgtcagcaatattatcctatcctcccagctcggaggtggcaccagctggaaataaaagggtggcggtggtcggcggtg
45 gtgggtcgggtggcggggagctctcaggtgcagttgaaggagtcaggacctggcctggcggccctcacagagcctgtcc
atcacatgcaccgtctcagggttctcattaaccgtctatgggttaactgggtcggcagcctccaggaaagggtctggactggctgg
gaatgatatggggtgatggaagcacagactataaattcagctctcaaatccagactgagcatcagtaaggacaactccaagagccaa
gttttctaaaaatggacagctctacaaactgatgacacagccaggtactactgtgccagagatcactatggtaccactatgctatgg
actactgggggtcaaggaaacctcagtcaccgtctcctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtcct
cagcacctgaactcctgggtggaccgtcagcttctcttccccccaaaacccaaggacacctcatgatctccggacctctgag
50 gtcacatgcgtgggtgggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataat
gccaaagacaagccgcgggaggagcagtaacacagcagtcaccgtgtgtgtcagcgtcctcaccgtctgcaccaggactggct

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gaatggcaaggagtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaaccatctccaaagccaaagggc
agccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgtgca
aaggcttctatccaagcgacatcgccgtggagtgaggagcaatgggcagccggagaacaactacaagaccacgctcccggtg
ctggactccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctc
5 cgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

Amino acid sequence:

MDSQAQVLMLLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
QKNYLA WYQQIPGQSPKLLIYWASTRESGVPDRFTGSGSGTDFLTISR VKAEDLA
10 VYYCQQYYTYPPTFGGGTKLEIKGGGSGGGGSGGGGSSQVQLKESGPGLVAPSQ
SLSITCTVSGFSLTVYGVNWRQPPGKGLDWLGMIWGDGSTDYNSALKSRLSISK
DNSKSQVFLKMDSLQTD TARYYCARDHYGTHYAMDYWGQGTSVTVSSDQEPK
SSDKTHTSPSSAPELLGGPSVFLFPPKPKDTLMISRTP EVTCVVVDVSHEDPEVKF
NWYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKA
15 LPAPIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESN
GQPENNYKTTTPVLDS DGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQ
KSLSLSPGK

61. FC2-2 VHL11S (SSS-S)H WCH2 WCH3

20 Nucleotide sequence:

gttgtaagcttgcgccatggaatcacaggccaggttctatgttactgctgctatgggtatctggtacctgtggggacattgtgatg
tcacagtctccatcctcctagctgtgtcagttggagagaaggtttctatgagctgcaagtcagtcagagcctttatataatcacat
caaaagaactacttggcctggtaccagcagataccagggcagctctctaaactgctgatttactgggcatccactagggaatctgg
ggtccctgatcgcttcacaggcagtgatctgggacagattcactctcaccatcagcagagtgaaggctgaagacctggcagttta
25 ttactgtcagcaataatatactatcctccacgttcggaggtggcaccaagctggaataaaagggtggcgggtggctcggcggtg
gtgggtcgggtggcggggagctctcaggtgcagtgaaaggatcaggacctggctcgggtggcgccctcacagagcctgtcc
atcacatgcaccgtctcagggttctcattaaccgtctatggtgtaactgggttcgccagcctccaggaaagggtctggactggctgg
gaatgatattgggtgatggaagcacagactataatcagctctcaatccagactgagcatcagtaaggacaactccaagagccaa
gtttcttaaaatggacagctacaaactgatgacacagccaggtactactgtgccagagatcactatggtaccactatgctatgg
30 actactggggtaaggaacctcagtcaccgtctcctctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtcct
cagcacctgaactcctgggtggaccgtcagctctcctctcccccaaaacccaaggacacctcatgatctcccgaccctgag
gtcatatcggtggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataat
gccaaagacaaagccgcgggagagcagtaacagacgtaccgtgtgtcagcgtcctcaccgtcctgcaccaggactgggt
gaatggcaaggagtacaagtgaaggtctccaacaagccctcccagccccatcgagaaaaccatctccaaagccaaagggc
35 agccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgacctgctgca
aaggcttctatccaagcgacatcgccgtggagtgaggagcaatgggcagccggagaacaactacaagaccacgctcccggtg
ctggactccgacggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctc
cgtgatgcatgaggctctgcacaaccactacacgcagaagagcctctccctgtctccgggtaaatgatctaga

40 Amino acid sequence:

MDSQAQVLMLLLLWVSGTCGDIVMSQSPSSLA VSVGEKVSMSCKSSQSLLYNHN
QKNYLA WYQQIPGQSPKLLIYWASTRESGVPDRFTGSGSGTDFLTISR VKAEDLA
45 VYYCQQYYTYPPTFGGGTKLEIKGGGSGGGGSGGGGSSQVQLKESGPGSVAPSQ
SLSITCTVSGFSLTVYGVNWRQPPGKGLDWLGMIWGDGSTDYNSALKSRLSISK
DNSKSQVFLKMDSLQTD TARYYCARDHYGTHYAMDYWGQGTSVTVSSDQEPK
SSDKTHTSPSSAPELLGGPSVFLFPPKPKDTLMISRTP EVTCVVVDVSHEDPEVKF
NWYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKA
LPAPIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESN
GQPENNYKTTTPVLDS DGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQ
50 KSLSLSPGK

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62. UCHL-1 VH

Nucleotide sequence:

atgggcaggcttacttctcattctgctactgattgttctgcataatgtcctctcccagattactctgaaagagcttgccctgggactct
gcagccctcccagaccctcagctgactgttcttctctgggtttcactgaccattatggtataggagtaggttgattcgtcagcct
5 ccagggaagggtctggagtggtgacacacatttggtggaatgataataagtactataacacagccctgaggagccggctcaca
tctccaaggattcctccaacaaccaagtactcctcaagatgccaatgtggacactgcagataccgccacatactactgtctctacg
gctacacttactggggccaaggactctggctactgtctctgca

Amino acid sequence:

10 MGRLTSSFLLIVPAYVLSQITLKESGPGILQPSQTLSTCSFSGFSLTTYGIGVGWIR
QPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNNQVLLKIANVDTADTAT
YYCLYGYTYWGQGLTVSA

63. UCHL-1 VL

Nucleotide sequence:

atgaagtgcctgtaggctgttggtgctgatgttctggattcctgcttccatcagtgatgttgatgacccaaactccactctccctgc
ctgtcagctctggagatcaggccctccatctcttcgagatctagtccagcctctttacagtaatggaacacattttacattggtacct
gcagaagccaggccagctccaaaactcctgatctacaaactttccaaaccgattttctgggggtcccagacaggttcagtgccagtg
20 atcaggagacagattcacactcaagatcagcagagtgaggctgaggatctgggagttatttctgctctcaaagtacacatgttccg
tggacgttcggtggaggcaccagctggaatcaaa

Amino acid sequence:

25 MKLPVRLVLMFWIPASISDVVMTQTPLSLPVS LGDQASISCRSSQSLLYSNGNTYL
HWYLQKPGQSPKLLIYKLSNRFSGV PDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
QSTHVPWTFGGGTKLEIK

64. UCHL-1 scFv

Nucleotide sequence:

gttgtaagcttgccgcatgaagtgcctgtaggctgttggtgctgatgttctggattcctgcttccatcagtgatgttgatgaccc
30 aaactccactctccctgcctgtcagctctggagatcaggccctccatctctgcagatctagtccagcctctttacagtaatggaac
acctatttaccattgtacctgcagaagccaggccagctcctccaaaactcctgatctacaaactttccaaaccgattttctgggggtcccaga
caggttcagtgccagtgatcaggagacagattcacactcaagatcagcagagtgaggctgaggatctgggagttatttctgctc
tcaaagtacacatgttccgtggacgttcggtggaggcaccagctggaatcaagatggcgggtggctcggcggtggtggatct
ggaggaggtgggagctctcagattactctgaagagcttgccctgggactcttcagccctcccagaccctcagctgactgttctt
35 tctctgggtttcactgaccattatggtataggagtaggttgattcgtcagcctccagggaagggtctggagtggtgacacacat
tgggtggaatgataataagtactataacacagccctgaggagccggctcacaatctcaagattctccaacaaccaagtactcct
caagatgccaatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaagggactctggtca
ctgtctctgctgatca

40 Amino acid sequence:

MKLPVRLVLMFWIPASISDVVMTQTPLSLPVS LGDQASISCRSSQSLLYSNGNTYL
HWYLQKPGQSPKLLIYKLSNRFSGV PDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
QSTHVPWTFGGGTKLEIKDGGGSGGGGSGGGGSSQITLKESGPGILQPSQTLSTCS
FSGFSLTTYGIGVGWIRQPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNN
45 QVLLKIANVDTADTATYYCLYGYTYWGQGLTVSAD

65. UCHL-1 VH I11SL12S

Nucleotide sequence:

50 gggagctctcagattactctgaaagagcttgccctgggactcttcagccctcccagaccctcagctgactgttcttctctgggtt
tcactgaccacttatggtataggagtaggttgattcgtcagcctccagggaagggtctggagtggtgacacacatttggtggaat

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gataataagtaactataacacagccctgaggagccggctcacaatctccaaggattcctccaacaaccaagtactcctcaagatcgc
caatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaaggactctggtcactgtctctgct
gatca

5 Amino acid sequence:
(GSS)QITLKESGPGSSQPSQTLSTCSFSGFSLTTYGIGVGWIRQPPGKGLEWLTHIW
WNDNKYYNTALRSRLTISKDSSNNQVLLKIANVDTADTATYYCLYGYTYWGQGT
LVTVSAD

10

66. UCHL-1 scFv VH L11S

Nucleotide sequence:

gttgtaagcttcccgccatgaagttgcctgttaggctgttggtgctgatgttctggattcctgctccatcagtgatgttgatgaccc
aaactccactctccctgcctgtcagctctggagatcaggcctccatctctgcagatctagtcagagcctctttacagtaatgaaac
15 acctattacattggtacctgcagaagccaggccagctctccaaaactcctgatctacaaactttccaaccgattttctggggtcccaga
cagggtcagtggtgagtcagggacagatttcacactcaagatcagcagagtgaggctgaggatctgggagtttattctgctc
tcaaagtacacatgttccgtggacgttcggtggaggccaccaagctggaaatcaaagatggcgggtggctcgggcgggtggtgatct
ggaggaggtgggagctctcagattactctgaaagagctctggccctgggagctccagccctcccagaccctcagctgactgttc
ttctctgggttttactgaccacttatggtataggagtaggttggttcgctcagcctccagggaagggtctggagtggctgacacac
20 atttggtggaatgataataagtaactataacacagccctgaggagccggctcacaatctccaaggattcctccaacaaccaagtactc
ctcaagatcgccaatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaagggactctggtc
actgtctctgctgatca

Amino acid sequence:

25 MKLPVRLLVLMFWIPASISDVVMTQTPLSLPVSLGDQASISCRSSQSLLYSNGNTYL
HWYLVKPGQSPKLLIYKLSNRFSGVSPDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
QSTHVPWTFGGGTKLEIKDGGGSGGGGSGGGGSSQITLKESGPGSSQPSQTLSTC
SFSGFSLTYYGIGVGWIRQPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNN
QVLLKIANVDTADTATYYCLYGYTYWGQGTTLVTVSAD

30

67. UCHL-1 scFv (SSS-S)H WCH2 WCH3

Nucleotide sequence:

gttgtaagcttcccgccatgaagttgcctgttaggctgttggtgctgatgttctggattcctgctccatcagtgatgttgatgaccc
35 aaactccactctccctgcctgtcagctctggagatcaggcctccatctctgcagatctagtcagagcctctttacagtaatgaaac
acctattacattggtacctgcagaagccaggccagctctccaaaactcctgatctacaaactttccaaccgattttctggggtcccaga
cagggtcagtggtgagtcagggacagatttcacactcaagatcagcagagtgaggctgaggatctgggagtttattctgctc
tcaaagtacacatgttccgtggacgttcggtggaggccaccaagctggaaatcaaagatggcgggtggctcgggcgggtggtgatct
ggaggaggtgggagctctcagattactctgaaagagctctggccctgggagctctgcagccctcccagaccctcagctgactgttctt
40 tctctgggttttactgaccacttatggtataggagtaggttggttcgctcagcctccagggaagggtctggagtggctgacacacat
ttggtggaatgataataagtaactataacacagccctgaggagccggctcacaatctccaaggattcctccaacaaccaagtactcct
caagatcgccaatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaagggactctggtca
ctgtctctgctgatcaggagcccaatctctgacaaaactcacacatcccaccgtcctcagcacctgaactcctgggtggaccgt
cagttctctcttcccccaaaacccaaggacaccctcatgatctccggaccctgaggtcacatgcgtgggtgggtggacgtgagc
45 cacgaagaccctgaggtcaagttcaactgtgactggacggcgtggaggtgcataatgccagacaaagccgcgggaggagga
gtacaacagcacgtaccgtgtggtcagcgtctcaccgtcctgcaccagactggctgaatggcaaggagtacaagtgcaaggtc
tccaacaaagccctcccagccccatcgagaaaaccatctcaaagccaaaggcagccccgagaaccacaggtgtacacct
gccccatcccgggatgagctgaccaagaaccaggtcagcctgacctgctggtcaaaggctctatccaagcgacatcgccgtg
gagtgaggagagcaatgggcagccggagacaactacaagaccacgcctcccgctggtgactccgacggtccttctctctac
50 agcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctcctgcatgaggtctgcacaaccact
acacgcagaagagcctctccctgtctccgggtaaatgatctaga

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Amino acid sequence:

MKLPVRLLVLMFWIPASISDVVMTQTPLSLPVSLGDQASISCRSSQSLLYSNGNTYL
HWYLYQKPGQSPKLLIYKLSNRFSGVSPDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
5 QSTHVPWTFGGGTKLEIKDGGGSGGGGSGGGGSSQITLKESGPGILQPSQTLSTLCS
FSGFSLTTYGIGVGWIRQPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNN
QVLLKIANVDTADTATYYCLYGYTYWGQGLTVTVSADQEPKSSDKTHTSPSSAP
ELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNA
KTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQ
10 PREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPVL
DSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

68. UCHL-1 scFv VHL11S (SSS-S)H WCH2 WCH3

Nucleotide sequence:

gttgtaagctgccgccatgaagtgccctgtaggctgttggtgctgatgttctggattcctgctccatcagtgatgttgatgaccc
aaactccactctccctgctgctgagcttgagatcaggcctccatctctgcagatctagtcagagcctctttacagtaaatgaaac
acattattacattggtacctgcagaagccaggccagctcctcaaaactcctgctacaaactttcaaccgattttctggggtccaga
caggttcagtgagcagtgatcaggacagatttcacactcaagatcagcagagtgaggctgaggtatctgggagttatttctgctc
20 tcaaagtacacatgttccgtggacgttcggtggagccaccaagctggaatcaaagatggcgggtgctcggcggtggtggtgatc
ggaggagtgaggctctcagattactctgaaagagctctggcctgggagctccagccctccagaccctcagctgactgttct
ttctctgggttttctgaccacttatggtataggagtaggttgattcgtcagcctccagggaagggtctggagtggtgacacac
atttggtggaatgataataagtactataacacagccctgaggagccggctcacaatctcaaggattcctccaacaaccaagtac
ctcaagatcgccaatgtggacactgcagataccgccacatactactgtctctacggctacacttactggggccaaggactctggtc
25 actgtctctgctgatcaggagcccaaatcttctgacaaaactcacacatccccaccgtcctcagcactgaaactcctgggtgacccg
tcagtcttctcttcccccaaaaccaaggacaccctcatgatctccggaccctgaggctacatgctggtggtggtgacgtgag
ccacgaagaccctgaggtaagttcaactggtacgtggagcggctggaggtgcataatgccagacaaagccgcgggaggagc
agtacaacagcagctaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggagtagaagtgaaggt
ctccaacaagccctccagccccatcgagaaaacatctccaaagccaaaggcagcccgagaaacacaggtgtacaccc
30 tgcctccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgctcaaggcttctatccaagcagacatcgccgt
ggagtgaggagcaatgggcagccggagaaactacaagaccagcctccgtgctgactccgacggctccttctctctta
cagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctccgtgatgcatgaggtctgcacaacca
ctacacgcagaagacgtctcctgtctccggtaaatgatctagaa

Amino acid sequence:

MKLPVRLLVLMFWIPASISDVVMTQTPLSLPVSLGDQASISCRSSQSLLYSNGNTYL
HWYLYQKPGQSPKLLIYKLSNRFSGVSPDRFSGSGSGTDFTLKISRVEAEDLGVYFCS
QSTHVPWTFGGGTKLEIKDGGGSGGGGSGGGGSSQITLKESGPGSSQPSQTLSTLCS
SFSGFSLTTYGIGVGWIRQPPGKGLEWLTHIWWNDNKYYNTALRSRLTISKDSSNN
40 QVLLKIANVDTADTATYYCLYGYTYWGQGLTVTVSADQEPKSSDKTHTSPSSAP
ELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNA
KTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQ
PREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTTPVL
DSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLSPGK

45

69. 5B9 VH L11S

Nucleotide sequence:

gggagctctcaggtgcagctgaagcagtcaggacctggctcagtcagtcctcagagacctgtccatcacctgcacagtctctg
gtttctattaactacatgctgtacactgggttcgagctcctcaggaaagggtctggagtggtgggagtgatgagtggtgg
50 aatcacagactataatgcagcttcatatccagactgagcatcaccaaggacattccaagagccaagtttcttaaaatgaacagtc

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tgcaacctaataacacagccatttactgtgccagaaatgggggtgataactacccttattactatgctatggactactgggggtcaa
ggaacctcagtcaccgtctcctcag

Amino acid sequence:

5 (GSS)QVQLKQSGPGSVQSSQSLSTCTVSGFSLTTYAVHWVRQSPGKGLEWLGVI
WSGGITDYNAAFISRLSITKDDSKSQVFFKMNSLQPNDAIYYCARNGGDNYPPY
YAMDYWGQGTSTVTVSS

10 73. 5B9 VH L11S scFv

Nucleotide sequence:

aagcttgcgcgaatgaggttctctgctcagcttctgggggtgcttctgctctggatccctggatccactgcagatattgtgatgacgca
ggctgcattctccaatccagtcactcttgaacatcagcttccatctcctgcaggtctagtaagagctcctacatagtaatggcatca
cttatttatttggtatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaacctggcctcaggagtcacagaca
15 gggtcagtagcagtggtcaggaactgatttcacactgagaatcagcagagtgagggtgaggatgtgggtgtttactactgtgctc
aaaatctagaacttccgctcagcttctgggtgctgggaccaagctggagctgaaacgggggtggcgggtggctcgggcgggtgggt
cgggtggcggcgggagctctcaggtgcagctgaagcagtcaggacctggctcagtcagtcctcacagagcctgtccatcacct
gcacagctctctggttctcattaactacatgctgtacactgggttcgccagctcctcaggaaagggtctggagtggctgggagtgat
atggagtgggtgaatcacagactataatgcagcttccatccagactgagcatcaccaaggacgattccaagagccaagtttctt
20 aaaatgaacagcttgcacctaataacacagccatttactgtgccagaaatgggggtgataactacccttattactatgctatgga
ctactggggtaaggaacctcagtcaccgtctcctcag

Amino acid sequence:

MRFSAQLLGLLVLPWPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHSNGITY
25 LYWYLQKPGQSPQLLIYQMSNLSAGVDPDRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGSGGGGSGGGGSSQVQLKQSGPGSVQSSQSLSI
TCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSGGITDYNAAFISRLSITKDDSKS
QVFFKMNSLQPNDAIYYCARNGGDNYPPYYAMDYWGQGTSTVTVSS

30

70. 5B9 scFv VHL11S (SSS-S)H WCH2 WCH3

Nucleotide sequence:

aagcttgcgcgaatgaggttctctgctcagcttctgggggtgcttctgctctggatccctggatccactgcagatattgtgatgacgca
ggctgcattctccaatccagtcactcttgaacatcagcttccatctcctgcaggtctagtaagagctcctacatagtaatggcatca
35 cttatttatttggtatctgcagaagccaggccagctctcctcagctcctgatttatcagatgtccaacctggcctcaggagtcacagaca
gggtcagtagcagtggtcaggaactgatttcacactgagaatcagcagagtgagggtgaggatgtgggtgtttactactgtgctc
aaaatctagaacttccgctcagcttctgggtgctgggaccaagctggagctgaaacgggggtggcgggtggctcgggcgggtgggt
cgggtggcggcgggagctctcaggtgcagctgaagcagtcaggacctggctcagtcagtcctcacagagcctgtccatcacct
gcacagctctctggttctcattaactacatgctgtacactgggttcgccagctcctcaggaaagggtctggagtggctgggagtgat
40 atggagtgggtgaatcacagactataatgcagcttccatccagactgagcatcaccaaggacgattccaagagccaagtttctt
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agcactgaactcctgggtggaccgtcagcttctcttcccccaaaacccaaggacacctcatgatctccggacctgagg
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45 caagacaaagccgggaggagcagtagcaacagcagctaccgtgtgtcagcgtcctcaccgtcctgcaccaggactggctga
atggcaaggagtacaagtgaaggtctccaacaagccctccagccccatcgagaaaaccatctccaagccaaggagcag
ccccgagaaccacaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagctgacctgctgggtcaaa
ggcttctatccaagcagatcgcctggagtgggagagcaatgggcagccggagaaactacaagaccacgctccctgct
ggactccgagggctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcagggaacgtcttctatgctcc
50 gtgatgcatgaggctctgcacaacctacacgcagaagacgtctcctctctccgggtaaatgatctagag

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PCT/US2003/041600

Amino acid sequence:

MRFSAQLLGLLVLPWIPGSTADIVMTQAAFSNPVTLGTSASISCRSSKSLHNSGITY
LYWYLQKPGQSPQLLIYQMSNLAGVPDFRFSSSGSGTDFTLRISRVEAEDVGVYYC
AQNLELPLTFGAGTKLELKRGGGSGGGGSSQVQLKQSGPGSVQSSQSLSI
5 TCTVSGFSLTTYAVHWVRQSPGKGLEWLGVIWSGGITDYNAAFISRLSITKDDSKS
QVFFKMNSLQPNDAIYYCARNGGDNYPIYYAMDYWGQGTSTVTVSSDQEPKSS
DKTHTSPSSAPELLGGPSVFLFPPKPKDTLMISRTPPEVTCVVVDVSHEDPEVKFNW
YVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPA
PIEKTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQP
10 ENNYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLS
LSPGK

15 **76. 2H7 scFv VH L11S (SSS-S)H P238SCH2 WCH3**

Nucleotide sequence:

aagcttccgccatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagctctccagcaatcctgtctgcatctccaggggagaaggcacaatgacttgcaggccagctcaagtgttaagttacatgcact
ggtaccagcagaagccaggtatctccccaaacctggattatgcccatccaacctggcttctggagtcctgtctgcttcagtg
20 gcagtggtctgggaccttactctctcacaatcagcagagtgagggtgaagatgctgccacttattactgccagcagtgaggtt
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ggagctctcaggcttactacagcagctggggtgagtggtgagggcctggggcctcagtgagatgctctgcaaggcttctggc
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gggtatacttctcacaatcagaagttcaaggccaaggccacactgactgtagacaaatctccagcacagcctacatgcagctcag
25 cagcctgacatctgaagactctgcggtctatttctgtgaagagtggtgtactatagtaacttactggtacttcgatgtctggggcac
agggaccacgggcaccgtctctctgatcaggagcccaaatctctgacaaaactcacacatccccaccgtctcagcaccgtgaact
cctgggggggagtcagctcttctctctcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtgg
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30 tacaagtgaaggtctccaacaaagccctccagccccatcgagaaaacaatctccaaagccaaagggcagccccgagaacc
acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgcaaggttctatccc
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gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtctctcatgctcctgatgcatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga
35

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHY
QQKPGSSPKPWIYAPSNLAGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
40 ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVYYNSYWFYFDVWGTTTVTVSSDQEPKSSDK
THTSPSSAPELLGGSSVFLFPPKPKDTLMISRTPPEVTCVVVDVSHEDPEVKFNWYV
DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
45 NYKTTTPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
PGK

78. 2H7 scFv VH L11S (SSS-S)H WCH2 WCH3

Nucleotide sequence:

50 aagcttccgccatggatttcaagtgcagatttcagcttctgctaatacagtgcttcagtcataattgccagaggacaaattgttctct
cccagctctccagcaatcctgtctgcatctccaggggagaaggcacaatgacttgcaggccagctcaagtgttaagttacatgcact

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ggtaccagcagaagccaggatcctcccccacccctggatttatgccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtgggtctgggacctcttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtggagttt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcggtggctcggcggtgggtgatctggaggaggtg
ggagctctcaggcttatctacagcagctcgggctgagtcggtgaggcctggggcctcagtgaaatgctcgaaggcttctggc
5 tacacatttaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctattatccaggaaat
ggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtgactatagtaactcttactggtacttcgatgctcggggcac
agggaccacggtcaccgtctctctgatcaggagcccaaatctctgacaaaactcacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttctctctcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtgg
10 tgggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgccaagacaaaagc
cgcgggaggagcagtacaacagcagctaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
tacaagtgaaggtctccaacaaagccctccagccccatcgagaaaacaatctccaaagccaaaggcagccccgagaacc
acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgctcaaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgctcccggtgctggactccgacg
15 gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga

Amino acid sequence:

MDFQVQIFSLLISASVIIARGQIVLSQSPAILSASPGEKVTMTCRASSSVSYMHWY
20 QQKPGSSPKPWYAPSNLASGVPARFSGSGSGTSYSLTISRVEAEDAATYYCQQWS
FNPPTFGAGTKLELKDGGGSGGGGSGGGGSSQAYLQQSGAESVRPGASVKMSCK
ASGYTFTSYNMHWVKQTPRQGLEWIGAIYPNGDTSYNQKFKGKATLTVDKSSS
TAYMQLSSLTSEDSAVYFCARVVYYNSYWFYFDVWGTGTTVTVSSDQEPKSSDK
THTSPSSAPPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYV
25 DGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE
KTISKAKGQPREPQVYTLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPEN
NYKTTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFCFSVMHEALHNHYTQKSLSLS
PGK

30

79. 2H7 scFv VH L11S (CSS-S)H WCH2 WCH3

Nucleotide sequence:

aagcttgcgccatgatttcaagtgcagatttcaagcttctgctaatcagtgcttcagtcataattgccagaggacaaattgttctct
cccagctctcagcaatcctgtctgcactctcaggggagaaggtcacaatgacttcaggccagctcaagtgttaattacatgcact
35 ggtaccagcagaagccaggatcctcccccacccctggatttatgccccatccaacctggcttctggagtcctgctcgttcagtg
gcagtgggtctgggacctcttactctctcacaatcagcagagtggaggctgaagatgctgccacttattactgccagcagtggagttt
taaccacccacgttcggtgctgggaccaagctggagctgaaagatggcggtggctcggcggtgggtgatctggaggaggtg
ggagctctcaggcttatctacagcagctcgggctgagtcggtgaggcctggggcctcagtgaaatgctcgaaggcttctggc
tacacatttaccagttacaatatgcactgggtaagcagacacctagacaggcctggaatggattggagctattatccaggaaat
40 ggtgatacttctacaatcagaagttcaagggaaggccacactgactgtagacaaatcctccagcacagcctacatgcagctcag
cagcctgacatctgaagactctgcggtctatttctgtgcaagagtgggtgactatagtaactcttactggtacttcgatgctcggggcac
agggaccacggtcaccgtctctctgatcaggagcccaaatcttctgacaaaactcacatccccaccgtcctcagcacctgaact
cctggggggaccgtcagttctctctcccccaaaacccaaggacacctcatgatctccggaccctgaggtcacatgcgtgg
tgggtggacgtgagccacgaagacctgaggtcaagttcaactggtacgtggacggcgtggaggtgcataatgccaagacaaaagc
45 cgcgggaggagcagtacaacagcagctaccgtgtggtcagcgtcctcaccgtcctgcaccaggactggctgaatggcaaggag
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acaggtgtacacctgccccatccgggatgagctgaccaagaaccaggtcagcctgacctgctgctcaaaggcttctatccc
agcgacatcgccgtggagtgggagagcaatgggcagccggagaacaactacaagaccacgctcccggtgctggactccgacg
gctccttctctctacagcaagctcaccgtggacaagagcaggtggcagcaggggaacgtcttctcatgctccgtgatgatgag
50 gctctgcacaaccactacacgcagaagagcctctcctgtctccgggtaaatgatctaga